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ART STUDIES

THE ALGORITHM OF TIME AND THE THEATRICAL CHARACTER: THE METAMORPHOSIS OF HUMAN CHARACTER IN CONTEMPORARY DRAMATURGY

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ABSTRACT

In the modern era, technological development—particularly the penetration of artificial intelligence (AI) into all areas of life—has profoundly affected human self-perception, social behavior patterns, and aesthetic thinking. These changes have not bypassed the art of theatre, reshaping the construction, motivation, and stage representation of human character in dramaturgy. This article analyzes the metamorphosis of the human figure in contemporary dramaturgy against the backdrop of conceptualizing the changing world as an "algorithm of time." Posthuman realities created by artificial intelligence, fragmented identities, and the notion of the performative subject are examined through the lens of theatrical texts and stage characters. As a result, it is argued that in contemporary theatre, the human character is no longer a stable psychological model but a dynamic, decentralized construct interacting with technological reality.

Keywords: contemporary theatre, artificial intelligence, dramaturgy, human character, posthumanism, theatrical figure.

Introduction

Throughout the history of theatre, the human character has remained the central structural unit of dramaturgy. In ancient tragedies, the character bore the weight of fate; in classical dramaturgy, they were a subject confronted with moral choice; in realist theatre, an individual shaped by the social environment. In the modern era, this trajectory has entered a new stage. Globalization, digitalization, and the development of artificial intelligence technologies have profoundly transformed human relationships with time, space, and the self.

Today, time is no longer linear; it has acquired an algorithmic character. Human behavior is increasingly shaped by statistical models, data flows, and artificial decision-making mechanisms. In this context, theatre faces a new fundamental question: who stands on stage—the human in the classical sense, or a new entity synthesized with technological reality? This transformation manifests not only at the level of content but also in the technical and aesthetic means of theatrical expression.

The formation of stage reality in theatre is no longer limited to dramaturgical text and actor performance; technical-aesthetic components such as sound and lighting play a crucial role in the meaning-making process of a performance. A failure to achieve the desired effect in sound design can weaken the emotional and semantic impact of a performance, while lighting solutions can radically alter the audience's aesthetic perception of a staged character. In this context, it becomes clear that theatrical reality is more constructive and conventional than objective [1].

In the modern era, changes in aesthetic perception have directly influenced audience profiles. For audiences shaped by intellectual and European aesthetic systems, the fixed expression patterns of classical theatre traditions and direct realist presentations often appear insufficiently complex [2]. This situation necessitates the development of new aesthetic strategies in dramaturgy and stage thinking, requiring the reconstruction of theatrical characters to correspond with contemporary social, technological, and cultural realities.

The concept of the "algorithm of time" in the modern era reflects the flow of human life within pre-programmed systems. Social networks, AI-based decision mechanisms, and digital control models invisibly guide daily human behavior. This condition is also mirrored in aesthetic consciousness. Theatre no longer merely presents a sequence of events; rather, it transforms fragmented, cyclical, and repetitive structures of time into stage language. In dramaturgy, the plot line often takes on a nonlinear form, and characters are presented less as agents of cause-and-effect relationships and more as subjects acting under the influence of systems. In the arts—particularly in theatre—the creative process is complex, and even the smallest overlooked technical or aesthetic element can directly affect the overall quality of a production. Theatre practice demonstrates that the impact of a staged event depends not only on dramaturgical material and actor performance but also on the aesthetic and technological environment in which they are presented [9].

The traditional classical theatre school was long based on mass scenes, large ensembles, grandiloquent actor speech, and predetermined performance templates [3]. Especially during the Soviet period, these expressive forms served as the dominant theatrical model, satisfying both ideological and aesthetic requirements. However, in contemporary theatre practice, such forms have largely lost their functionality.

For the modern audience—particularly the intellectual viewers shaped by European aesthetic thought—fixed and direct modes of classical theatre

expression often appear insufficiently complex and multi-layered. The conventional or symbolic nature of theatre becomes more evident at this stage, and stage reality is reconstructed through technological means.

In this context, lighting and sound technologies have become integral components of a performance's aesthetic structure. While dramaturgical material, directorial decisions, stage design, and actor performance remain the pillars of a production, their synthesis with technological expressive tools enables the creation of high-quality theatre that meets contemporary audience expectations [4]. The development of technological capabilities in modern theatre is no longer an auxiliary element but a fundamental condition for aesthetic unity.

In contemporary theatre practice, actor performance and directorial decisions continue to serve as the main artistic pillars of a production. However, the synthesis of these elements with modern technological tools—particularly lighting and sound effects—significantly enhances the aesthetic appeal of the performance and its communicative impact on the audience. In this context, technology does not alter the essence of theatre; rather, it functions as a factor that expands its expressive potential.

Common claims about the declining interest in theatre do not fully reflect contemporary cultural realities. Historically, theatre has always been an art form that generates public interest, and this interest has manifested in various aesthetic and technological forms across different periods. Today, the main variable is audience taste and their aesthetic expectations. The accelerating pace of technological development demands new approaches within the theatrical environment, and failure to adapt may weaken the theatre's impact [5].

The development of modern theatre cannot rely solely on state support. Upgrading technical infrastructure, implementing alternative funding mechanisms, and expanding institutional support models are essential conditions for the sustainable development of theatrical art. In this regard, theatre should be considered not only as an aesthetic object but also as a cultural strategy.

Main part

As a fundamental form of culture, theatre plays a vital role in shaping the aesthetic and moral memory of society. Creating a theatrical environment that meets contemporary demands is essential to preserve the vitality and relevance of this art form. Modern theatre, therefore, functions as a cultural institution that simultaneously carries technological innovation and its historical-aesthetic mission [11].

In traditional dramaturgy, character was built on psychological wholeness, the continuity of past–present–future, and internal conflict; in contemporary dramaturgy, this model is fragmented. The human character no longer possesses a stable identity; it moves among variable roles and exists in a symbiotic relationship with technology [8].

As a result of artificial intelligence's aesthetic influence, a dramaturgical character sometimes ceases to be a decision-making subject and instead becomes an executor of decisions. This shift requires a reconsideration of classical dramaturgical categories such as free will, responsibility, and moral choice [7]. Theatre is one of the oldest cultural forms that embodies the multilayered experiences of human existence on the stage. In this art form, actor activity is not limited to displaying the external traits of a character; the creation of a role requires the complex integration of an individual's psychological state, emotional responses, and physical presence into the stage reality. The process of working on a role functions as a sophisticated creative mechanism, demanding high professional preparation, internal focus, and a temporary transformation of personality [12]. In this respect, the formation of a character is considered a central component of the aesthetic and conceptual structure of theatre.

Various artistic systems and performative approaches that have developed in theatre practice evolved on a unified methodological basis. This foundation is characterized by a psychologically based performance model that emphasizes the internal motivation and emotional grounding of behavior in the actor's art. Such a model allows for the construction of cause-and-effect relationships on stage and the sequential development of the character's internal logic. Different theatrical directions that emerge on this methodological foundation achieve aesthetic continuity and expressive integrity.

In contemporary theatre, the application of technical and digital tools has significantly expanded the visual and acoustic possibilities of stage presentation. Lighting technologies, sound design, and multimedia solutions have become crucial elements shaping the perception structure of a performance. However, the functionality of these tools is directly dependent on the presence of the human factor at the center of the stage action. Technological components should not be regarded as independent aesthetic goals; rather, they are complementary mechanisms that enhance the expressive power of the human character.

One of the main challenges of contemporary theatre is maintaining a balance between technological capabilities and the embodiment of human presence on stage. If the psychological depth and emotional grounding of human behavior are weak, even the most innovative technological solutions fail to ensure the impact of a performance. Conversely, when actor performance based on internal motivation integrates organically with the technological environment, the production achieves stable aesthetic value and establishes more enduring communication with the audience [6].

Individual life experience and observational practice also play an important role in actor creativity. Personal memory mechanisms and associative thinking processes serve as significant creative resources in character formation. Transforming real-life observations into stage material increases the plausibility of the character and deepens the emotional connection with the audience. Thus, the theatrical character emerges not as an abstract construct but as an aesthetic generalization of human experience.

Posthumanist theory decenter the human, evaluating it on the same ontological plane as technology, nature, and artificial systems. In contemporary theatre, this approach is clearly reflected in the construction of characters.

The Human Character on Stage: The character is presented through mechanical movements, roboticized speech, and emotional distance. These aesthetic choices visualize the alienation and identity crisis that humans experience in the face of technological reality. The character no longer functions as an "internal monologue" but exists as a performative unit operating within a system.

Artificial intelligence participates not only as a theme but also in shaping the dramaturgical structure. In some contemporary theatre examples, algorithmic thinking influences the composition of the text, the rhythm of dialogues, and the stage design. In this context, dramaturgy favors open endings, multi-variant narratives, and interactive stage solutions.

Thus, the audience ceases to be a passive observer and becomes part of algorithmic time. In the modern era, theatre is not only a means of aesthetic expression but also a testing ground for technological innovations. The inclusion of AI in the dramaturgical process enriches the classical theatre language with new expressive possibilities without rejecting it. Dramaturgy is no longer solely the product of authorial imagination but emerges as a result of human–machine collaboration. This synthesis gives theatrical texts new structure, rhythm, and semantic layers.

Artificial intelligence plays a significant role in the analysis and construction of dramaturgical texts. Machine learning algorithms can analyze thousands of plays to identify emotional peaks, conflict points, and dramatic pauses in plot lines. This allows playwrights to create more balanced, dynamic, and audience-oriented texts. As a result, the dramaturgical language becomes more flexible, predictable, and simultaneously individualized.

A key feature of the new dramaturgical language is interactivity. AI can analyze audience reactions in real time and influence the course of the plot. The audience ceases to be merely spectators and becomes active participants in the dramaturgical process. This approach transforms theatrical texts from static structures into living, mutable forms, making each performance a unique dramaturgical experience.

The application of artificial intelligence also reinterprets the concepts of time and space in dramaturgy. With the support of virtual and augmented reality technologies, events can unfold simultaneously in different locations, and the past, present, and future can be presented in parallel on stage. This liberates dramaturgical language from chronological sequence, directing it toward more metaphorical and multilayered systems of meaning.

The new dramaturgical language also creates extensive opportunities for multilingualism and intercultural communication. AI-based simultaneous translation and voice synthesis technologies allow performances to be presented in different languages while maintaining the same emotional impact. This accelerates the integration of national dramaturgy into the global theatrical space and transforms theatre into a universal platform for cultural dialogue.

At the same time, AI raises ethical and aesthetic questions in dramaturgy. Issues such as the role of the human factor in creativity, authorship, and emotional authenticity become subjects of new discussion. However, it is clear that AI does not replace the playwright; rather, it functions as a powerful tool that expands creative possibilities [13].

Consequently, the new dramaturgical language shaped by AI carries theatre into the future without severing it from its classical roots. This language harmonizes technology and art, adapting theatre to the expectations of contemporary audiences while enhancing its emotional and aesthetic power.

In contemporary dramaturgy, the metamorphosis of the human character is an inevitable aesthetic consequence of a changing world. The concept of the "algorithm of time" demonstrates that the human character in theatre is no longer formed on the basis of classical psychological models but as a synthesis of technological, social, and philosophical influences [10].

In the AI era, theatre does not lose the human; rather, it places humanity before new questions: Who is human? Where does the human begin, and where does technology end? The power of contemporary theatre lies precisely in its ability to return these questions to society through the stage.

"Sound designers may fail to achieve the desired effect; with lighting, it is possible to make the most beautiful person appear grotesque or the most grotesque person appear beautiful. For audiences shaped by intellectual and European thinking, old classical traditions often appear somewhat simplistic."

Conclusion

In conclusion, the topic *"The Algorithm of Time and the Theatrical Character: The Metamorphosis of Human Character in Contemporary Dramaturgy"* clearly highlights how contemporary theatre recodes the relationship between humans and time. Modern dramaturgy no longer presents character as a fixed psychological model but as a dynamic, fragmented, and contextual structure. The linearity of time gives way to algorithmic logic, producing metamorphosis both within the inner world of the character and in the stage design. The human character becomes a dynamic process shaped at the intersection of social, technological, and ideological influences.

This approach transforms the audience from passive observers into active interpreters, presenting theatre not only as an aesthetic space but also as a site for philosophical and intellectual dialogue. The fragmentation of time, the instability of memory, and the multiplicity of identity become central artistic tools in contemporary dramaturgy, foregrounding the problem of self-perception. As a result, the theatrical character moves away from the classical hero model, emerging as a complex symbol that reflects the contradictory and mutable nature of contemporary human experience. This significantly expands the aesthetic and conceptual possibilities of modern dramaturgy.

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CHEMICAL SCIENCES

SYNTHESIS OF TRITHIOCARBONIC ACID ESTERS AND STUDY OF THEIR TRIBOLOGICAL AND ANTIOXIDANT PROPERTIES

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ABSTRACT

The article is devoted to a current problem of the present time, which consists in the creation of new highly effective additives for transmission oils and antioxidants for fuels.

A number of new trithio acid esters have been synthesised, containing two arylsulpho groups (bis-trithiocarbonates, as well as a combination of one arylsulpho group and allyl and benzyl fragments in one molecule (mixed trithio acid esters).

The resulting mixed esters of trithiocarbonic acids were studied as anti-wear and extereme pressure additives.

The tribological properties were studied in a semi-synthetic oil, which was a mixture of MC-20 aviation oil and PEE (pentaerythritol ester) synthetic oil taken in a 1:1 ratio.

Due to the limited solubility of bistrithiocarbonates in mineral oils, they were studied as antioxidants for fuels. The antioxidant properties of the compounds were studied using a special manometric setup.

The composition and structure of the synthesised compounds were confirmed by studying their physicochemical properties, elemental composition and IR spectroscopy.

Keywords: bistrithiocarbonates, antioxidant properties, tribological properties, transmission oils.

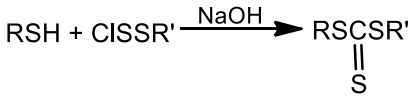
Introduction

Trithioacetic acid forms two series of neutral esters: asymmetrical ones, with different radicals at each sulphur atom, and symmetrical ones, with identical radicals at both sulphur atoms.

Trithioacetic acid derivatives are structurally similar to dithioacetic acid derivatives and differ only in the presence of an additional sulphur atom in the molecule instead of an oxygen atom. Therefore, both asymmetric and symmetric trithioacetic acid esters can be synthesized using methods similar to those used for synthesizing dithioacetic acid esters. However, it should be noted that trithioacetic acid esters, including the methods for their production, are much less studied than dithioacetic acid esters.

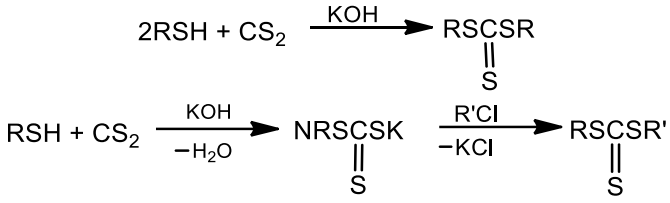
The main methods for obtaining dithioacetic acid esters can be used for the synthesis of trithioacetic acid esters.

One of them involves the interaction of mercaptans with chloroformates in the presence of alkalis:



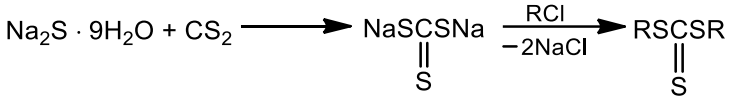
The disadvantage of this method is the multi-stage nature of obtaining the initial chloroformate and the duration of the reaction, which takes 16-19 hours [1].

A more convenient classical method for obtaining asymmetric and symmetric esters of trithioacids is the interaction of mercaptans with carbon disulphide in the presence of alkalis:



This reaction can be carried out in a solution of water [2] or a large amount of alcohol [1].

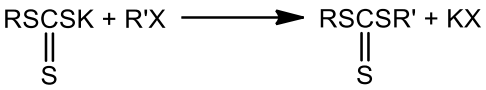
However, the most acceptable method for obtaining symmetrical trithiocarbonates is the interaction of sodium sulphide with carbon disulphide in an aqueous medium [3], followed by treatment of sodium trithiocarbonates with halogen derivatives:



The authors of this work also applied the specified method for obtaining symmetrical and mixed esters of trithioacetic acids.

However, the research revealed that the most suitable solvent for these reactions was dimethylformamide, which, being a strongly polar aprotic solvent, facilitates the production of alkali metal trithiocarbonate and its further interaction with halogen-containing compounds, ensuring high yields of the final products.

At the Institute of Chemistry of Additives, extensive work has been carried out on the synthesis of trithiocarbonic acid esters, with their subsequent use as anti-wear and extreme pressure additives for transmission oils [4-6].

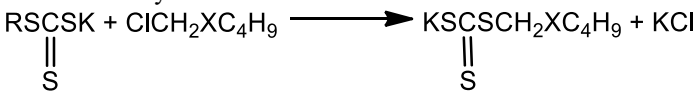


Where, R=C_4H_9, C_5H_{11}, $C_6H_5CH_2$; R′ = CH_2=CH–CH_2

R=C_4H_9; R′=C_7H_{15}; R=$C_6H_5CH_2$, R′=C_4H_9

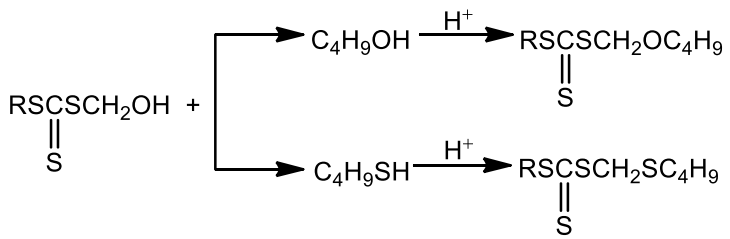
X = Cl; X = Br

In the case of using organochlorine compounds that are easily subject to hydrolysis, the initial alkali metal trithiocarbonate was obtained in crystalline form in an aprotic solvent, followed by interaction with halogen-containing compounds [7]:



Where, R=C_4H_9, C_5H_{11}, $C_6H_5CH_2$; X = O,S

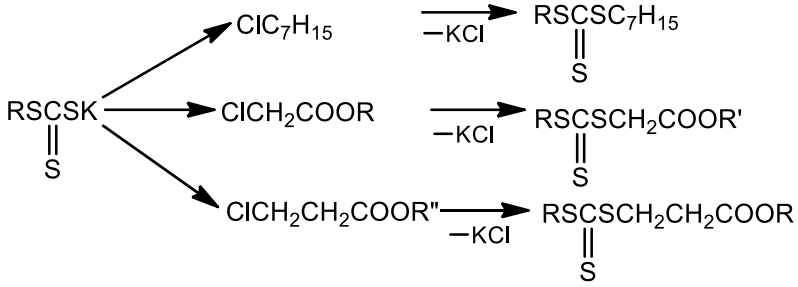
The above compounds were also synthesized by counter synthesis, the interaction of hydroxymethyl esters of trithiocarbonic acids with alcohols and mercaptans:



Where, R=C_4H_9, C_5H_{11}, $C_{12}H2_5$

The initial hydroxymethyl esters of alkyl trithioacids were obtained by reacting alkyl xanthogenates of alkali metals with formaldehyde in an aqueous medium under concentrated hydrochloric acid at a temperature of 5-10°C. The identity of the compounds obtained by both methods was proven by comparing NMR and IR spectra [8].

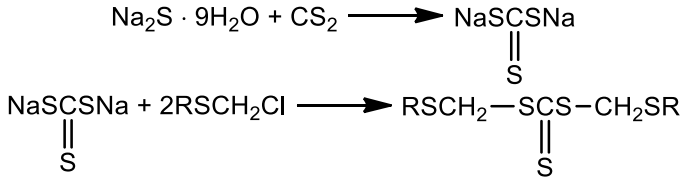
The authors obtained a number of compounds by reacting alkylmonochloroacetate, alkyl-2-chloropropionate, and heptyl chloride with alkali salts of trithioacetic acids according to the following reaction scheme:



Where, R=C_4H_9, C_5H_{11}; R′ = R″ = C_2H_5, C_4H_9

As studies of the tribological properties of compounds have shown, all synthesized compounds have high extreme pressure properties in transmission oil [9].

Mustafaev N.P. et al. synthesized bis(alkylthiomethyl)trithiocarbonates by reacting sodium trithiocarbonate with alkylthiomethyl chloride:

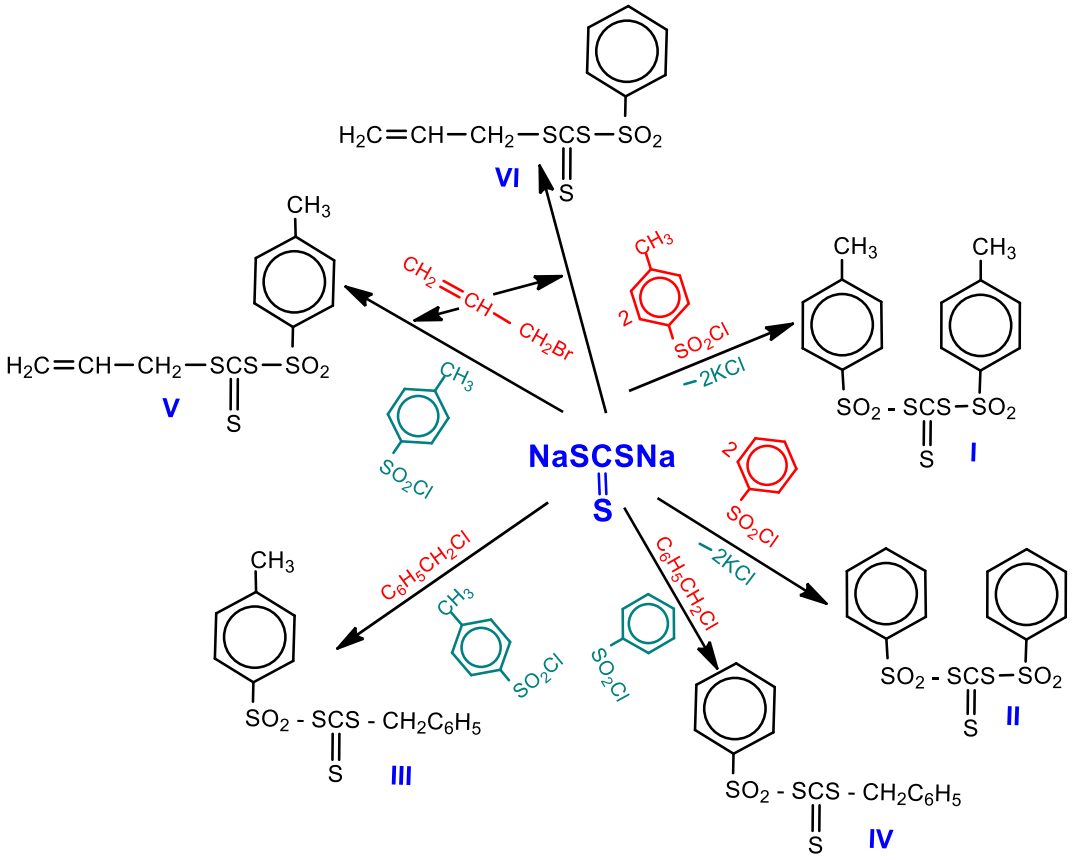


Где, R=C_4H_9, C_5H_{11}

Continuing our work on the synthesis of trithio acid esters and their study as additives for various purposes, we synthesized a number of new trithio acid esters containing 1 or 2 arylsulpho groups.

The scheme of the compounds synthesised by the authors of the article is presented below:

Synthesis of various arylsulfotrithocarbonates by reaction of arylsulfoxylides with sodium tritiocarbonate.



Experimental part

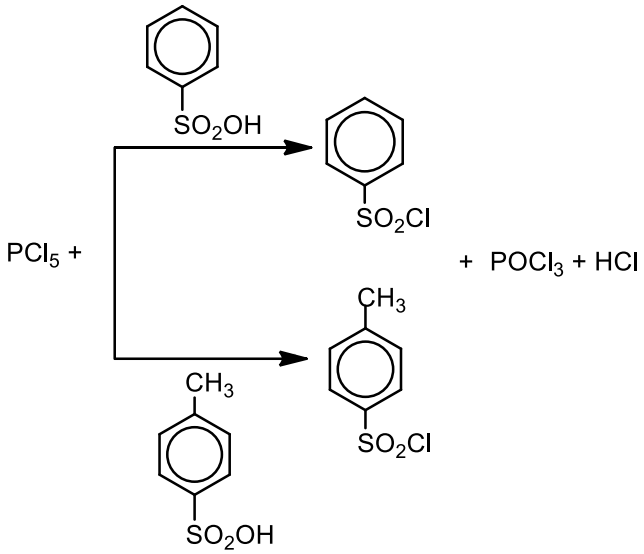
The uniqueness of the compounds obtained was proven by determining their elemental composition, elements C, H, S, were determined using a TruSpec-Micro analyser (LECO), refractive index (n_D^{20}), specific gravity (d_4^{20}) with subsequent calculations of MRD found and MRD calculated and their comparison, as well as IR spectroscopy.

IR spectra were recorded on a SPECORD-75 IR spectrophotometer (Carl Zeiss, GDR) using KBr, NaCl and Lif prisms in the range 4000÷400 cm^{-1}.

Trithioasetic acid salts are similar in structure and chemical properties to xanthogenic acid derivatives. However, it should be noted that, unlike xanthogenic acid esters, tritioic acid esters have not been fully studied. Therefore, the synthesis of new compounds from a series of trithiocarbonic acid esters and their study, in particular the inclusion of an arylsulpho group in the molecule, is of particular interest, since trithiocarbonates with this group were first synthesised and studied by us. Sodium sulphide, phenyl- and toluene-sulphochlorides, allyl bromide and benzyl chloride are used as starting materials for the synthesis of these substances. Phenyl- and toluene-sulphochlorides and sodium trithiocarbonate were synthesised by the authors.

Synthesis of aryl sulfochlorides from the reaction of aryl sulfonic acids with phosphorus pentachloride.

These starting materials were obtained by the known method according to the following scheme [10]:



Preparation of benzenesulphochloride:

In a flask connected to a cooling bath, 15.7 (0.1 mol) benzene sulphonic acid and 20.6 g (0.1 mol) of phosphorus pentachloride are added and heated at 120°C for 30 minutes. After the mixture has cooled, 200 ml of benzene is added to the flask, and the mass is heated again at 80°C for 1 hour. The benzene and $POCl_3$ are then evaporated. The obtained substance is a liquid. Yield – 82%. $n_D^{20} = 1.5480$

The elemental analysis of the substance is as follows:

$C_6H_5SO_3$: Found, %: C 45.85; S 20.38; H 3.18

Calculated, %: C 45.07; S 20.23; H 3.12

Preparation of toluenesulphochloride:

The toluene sulphochloride used as the starting material was prepared by us using the known method, employing toluene sulphonic acid ($TsOH \cdot H_2O$) and phosphorus pentachloride:

In a flask connected to a reflux condenser, 34.4 g (0.2 mol) of toluenesulphonic acid and 41.2 g (0.2 mol) of phosphorus pentachloride (PCl_5) are added and heated at 120°C for 30 minutes. After the mixture has cooled, 200 ml of benzene is added to the flask, and the mass is heated again for 1 hour at 80°C. The benzene and $POCl_3$ are then evaporated, and the crystals remaining in the flask are p-toluolsulfonchloride. Yield – 75%. Tmp = 64.5°C.

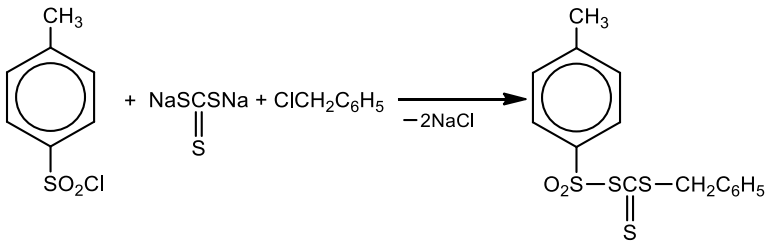
The elemental analysis of the substance is as follows:

$C_7H_7SO_2Cl$: Found, %: C 43.92; H 3. 52; S 16.63; Cl 18.48

Calculated, %: C 43.1; H 3.68; S 16.8; Cl 18.64

p-Toluolsulfobenzyltrithiocarbonate (III) [11]

Toluolsulfobenzyltrithiocarbonate is obtained from the reciprocal synthesis of toluolsulfoxychloride and benzyl chloride with sodium trithiocarbonate:



The reaction to obtain toluenesulphobenzyltriocarbonate was carried out in two stages:

Stage I. Preparation of sodium trithiocarbonate

To a 7.8 g (0.1 mol) of sodium sulfide, stirred in 40 ml of water in a reaction flask, is added 7 ml (0.1 mol) of carbon disulfide. The reaction mixture is stirred for 1 hour at 30-35°C. Stirring is then continued for a further hour at 40-45°C.

Stage II. To the resulting aqueous solution of sodium trithiocarbonate, 8 g (0.05 mol) of toluene sulfochloride is added in portions and stirred at 60-65 °C for 3 hours, then 7.6 g (0.05 mol) is added dropwise and

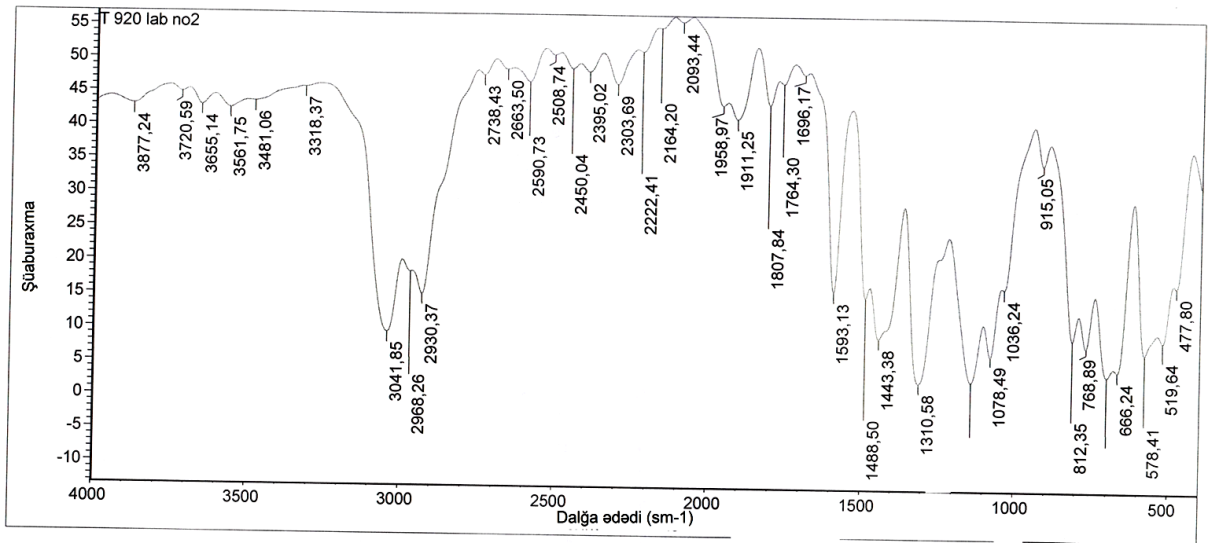
the mixture is stirred for 2 hours at 60-65°C. The resulting material is extracted with benzene, washed with water, and the benzene is evaporated. The resulting trithiocarbonate is a crystalline substance. Mp. -50°C.

The elemental composition of the substance is as follows:

$C_{15}H_{14}O_2S_4$: Found, %: C – 50.72; H – 4.15; S – 35.98

Calculated, %: C – 50.85; H – 3.96; S – 36.16

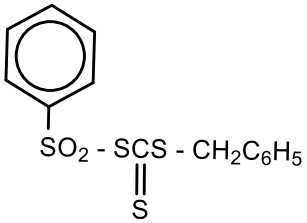
The chemical structure was confirmed by IR spectroscopy using an UR-20 instrument.



Fiqure 1. IR spectrum of p-toluolsulphobenziltrithiocarbonate

In the IR spectrum of the substance, the absorption band for the valence vibrations of the CH bond on the aromatic nucleus is observed at 3041.85 cm^{-1}, and the absorption bands for the valence vibrations of the CH bond are observed in the 2963.50 cm^{-1} and 2738 cm^{-1} regions. The deformation vibration absorption band of this bond is not observed. Characteristic absorption bands of the aromatic nucleus are observed at 1593 cm^{-1}, 1488.50 cm^{-1}, and 1449 cm^{-1}. The absorption band of the C=S group of the trithiocarbonate is observed at 1078 cm^{-1}, that of the C–S group at 578 cm^{-1}, and the absorption band of the valence vibrations of the SO_2 bond at 1217 cm^{-1}.

Analogously, phenylsulfobenzyltrithiocarbonate **(IV)** was also prepared.



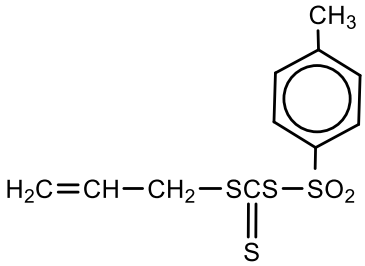
Mp. –74-75ºC.

The elemental analysis of the substance is as follows:

C14H12O2S4: Found, %: C 49.56; H 3.64; S 37.48

Calculated, %: C 49.41; H 3.53; S 37.65

Preparation of p-toluolsulfoalliltrithiocarbonate (V) [12]:



First, 7.8 g (0.1 mol) of sodium triacetophenesulfonate is prepared in an aqueous solution in a reaction flask. Then, 7.6 g (0.04 mol) of toluene sulfochloride is added in portions. The reaction is stirred for 3 hours at 60-65°C. Then, 5 g (0.05 mol) of allyl bromide is added and the reaction is stirred for a further 4 hours at the same temperature. Benzene is then added to the flask, and the benzene-extractable material is washed with water. The benzene is removed and the residue is dried under vacuum. Mp. 133-135°C.

The elemental analysis of the compound is as follows:

$C_{11}H_{12}O_2S_4$: Found, %: C –43.28; H –3.82; S –41.92

Calculated, %: C–43.42; H–3.95; S–42.11

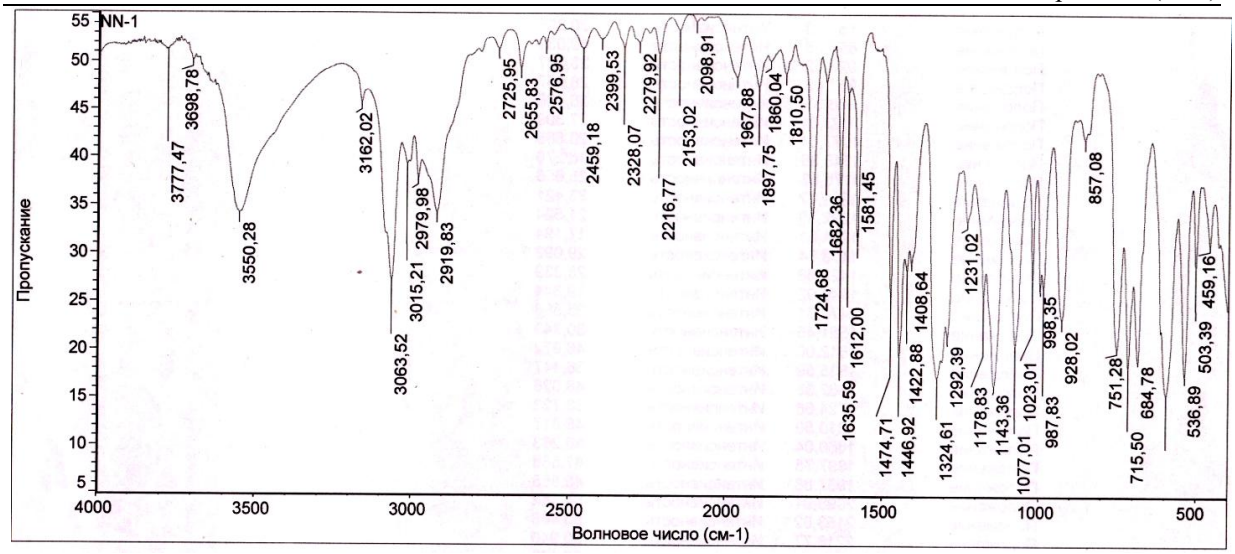
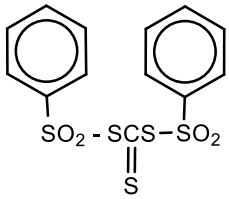


Figure 2. IR spectrum of p-toluolsulfoalliltrithiocarbonate

In the IR spectrum of the substance, the absorption bands of the double bond valence vibrations are at 1724.68 cm^{-1} and 1682 cm^{-1}, and the absorption bands of the π-C=H bond in the aromatic nucleus are at 3162 cm^{-1}, at 3063.52 cm^{-1}, at 3015 cm^{-1}, the valence vibration absorption band of the S–O bond at 1178.83 cm^{-1}, The vibrational absorption band of the C-S bond was observed in the 459.16 cm-1 region, and the deformation absorption band of the CH bond in the CH_2 group, CH, was observed in the 1474.71 cm^{-1} region.

Preparation of bis(phenylsulfonyl)trithiocarbonate (II):



Phosgene (17.6 g, 0.1 mol) is added dropwise to a 7.7 g (0.05 mol) solution of sodium trithiocarbonate in water in a reaction flask. The reaction is stirred for 5 hours at 60-65°C. Benzene is added to the resulting mixture and the benzene layer is washed with water, the solvent is evaporated and dried under vacuum. The resulting material is obtained as a crystalline solid. Mp. 69-70 °C.

The elemental analysis of the material is as follows:

C13H10O4S5: Found, %: C–40.23; H–2.42; S–40.85

Calculated, %: C–40.00; H–2.56; S–41.03

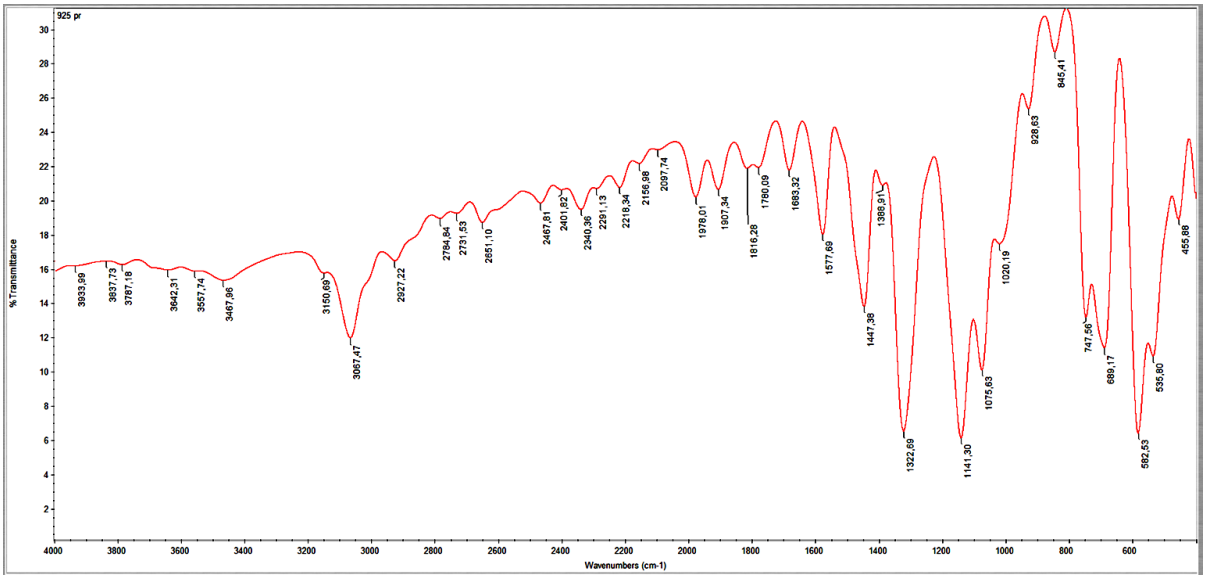


Figure 3. IR spectrum of bis(phenylsulfo)trithiocarbonate

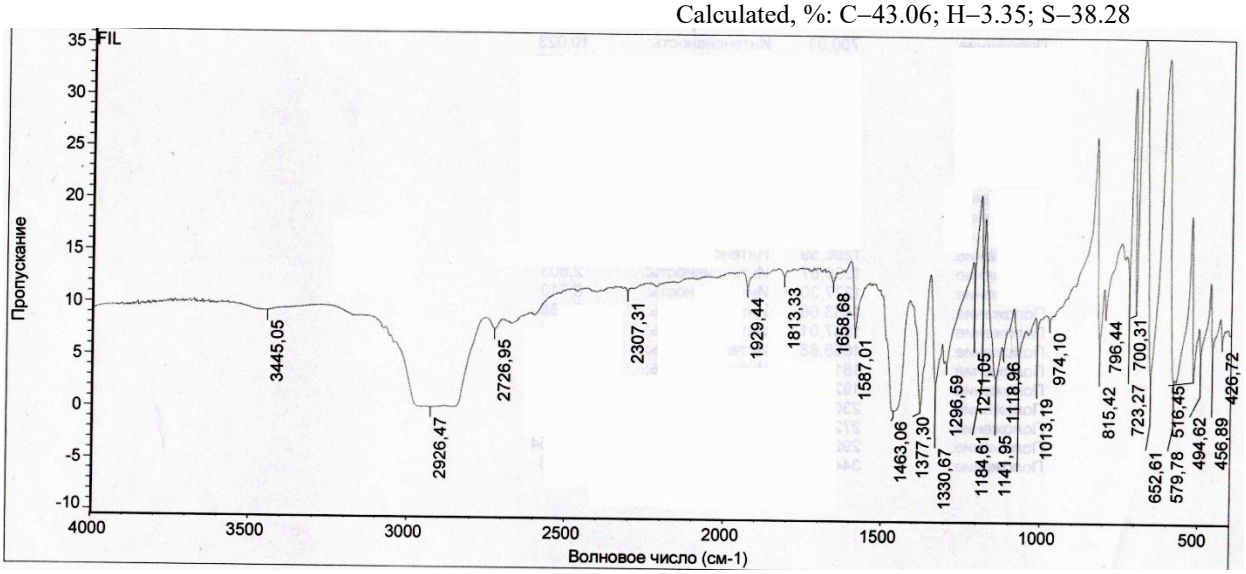
In the IR spectrum of the substance, the absorption bands of the CH bond are at 3150.69 cm-1 and 3067 cm^{-1}, the characteristic absorption bands of the CH bond of aromatic nuclei are at 1577.69 cm^{-1}, The absorption band of the valence vibrations of the S=O bond was observed at 1322.69 cm^{-1}, and the valence vibrations of the CH bond on aromatic nuclei were characteristic absorption bands at 1577.69 cm^{-1}.

Analogously, bis(toluolsulfo)tritylcarbonate **(I)** was prepared by this method.

The elemental analysis of bis(toluolsulfonyl)trifluorocarbonate is as follows:

$C_{15}H_{14}O_4S_5$: Found, %: C–43.23; H–3.18; S–38.12

Calculated, %: C–43.06; H–3.35; S–38.28



Fiqure 4. IR spectrum of bis(trifluoromethane)sulphotrithiophosphorocarbonate

The IR spectrum of the substance shows a characteristic absorption band of the aromatic nucleus at 1587 cm^{-1}, absorption bands of the ν_{C-S} bond at 815, 652, 661 cm^{-1}, for the SO_2 groups, the $\nu_{S=O}$ bond absorption bands were observed in the 1184.61–974 cm^{-1} and $\nu_{C=S}$ bond absorption bands were observed in the 1296.59–1118.96 cm^{-1} regions.

Results and discussion

Study of the tribological properties of some synthesized arylsulfonic acids

The reliability of operation of various machines and mechanisms plays a major role in the country's economy. Therefore, as mentioned earlier, the creation of high-quality new additives to lubricating oils, which directly participate in extending the service life of machines and mechanisms, is of great practical importance. One of such additives is trithiocarbonates. This work presents new arylsulfotrithiocarbonates that have not been previously described in the literature. It should be noted that in the relevant foreign literature there is much less information about trithiocarbonic acid esters than about dithiocarbonic acid esters. However, the Institute of Additive Chemistry has developed a fairly extensive material on this class of compounds as additives to lubricating oils. [13-17].

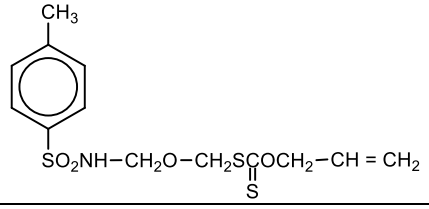
The extreme pressure properties were determined according to GOST 9490-75. The calculated indicators were the load wear index (LW_I) (*load wear index* – an indicator indicating the effectiveness of extreme pressure properties in the interval between the welding load and the seizing load; the higher this indicator the better), critical load (CL) (*seizing load* – the mode in which the oil film and sliding of rubbing surfaces becomes difficult; in this case, the hydrodynamic friction mode is replaced by a semi-dry friction mode), welding load (WL) (*welding load* – is the force at which the rubbing surfaces are not able to slide relative to each other; moreover, high specific loads cause critical increase in temperature in the direct contact zone, which, in turn, entails welding of the contacting surfaces).

The extreme pressure properties were studied on a four-ball friction machine (FBM-1) according to GOST 9490-75 on steel balls ШХ-15 with a diameter of 12.7 mm and a rotation speed of the upper ball of 1420 rpm.

Table 1 shows the data for 5% samples of p-arylsulfothrithiocarbonates and, for comparison, allyl xanthogenatomethyltoluenesulfamide prepared in semi-synthetic oil, which is a mixture of base oil SN-1200 and PEE (pentaerythritol ester of carboxylic acids)) in a 1:1 ratio.

Table 1

Results of research into the tribological properties of aryl sulfotriocarbonates

№	Compounds	Concentration of samples in oil, %	Extreme pressure properties GOST 9490-75			Wear spot diameter, W_d, mm
			Load wear index, LW_I, N	Critical load, C_l, N	Welding load, W_l, N	
1.	Semi-synthetic oil – SN-1200 yağı + PEE (1:1)	–	283	686	980	1,25
2.	Semi-synthetic oil + *p*-Toluenesulphonylbenzyltrithiocarbonate **(III)**	5	486	980	3096	0,85
3.	Semi-synthetic oil + *p*-Toluenesulphonylallyltrithiocarbonate **(V)**	5	500	980	3724	0,75
4.	Semi-synthetic oil + *p*- Phenylsulphonylallyltrithiocarbonate **(VI)**	5	548	980	3479	0,72
5.	Semi-synthetic oil + *p*- Phenylsulphonylallyltrithiocarbonate **(VI)** + 1,5% DF-11	3	–	–	–	0,62
6.	Allylsantogenatomethyltoluenesulphonamide (for comparison) 	3	363	784	1060	

As follows from the results of the study, all synthesized mono-arylsulfotritiocarbonates possess high extreme pressure properties, as follows from the presented data, allyl xanthogenatomethyloxymethyltoluenesulfamide synthesized by the same authors. They also surpass the weld load of the universal oils "Rossoil RZh" and "Rossoil Vedeshka" produced in Russia. Thus, the weld load (WL) of these oils is 1960 N and 1568 N, respectively [18]. The high extreme pressure properties of the synthesized aryl trithiocarbonates can be explained by the presence of reactive radicals (allyl, benzyl) at the sulfur atoms in the molecules, as well as the trithiocarbonate fragment, the composition of which includes two thiol and one thionic sulfur, which also play an important role in achieving high extreme pressure properties. To more clearly understand the mechanism of action of the additives, it is necessary to pay attention to what the surface layer of the metal surface is. Atoms located on the surface of a metal have free bonds that are not compensated by neighboring atoms. Because of this, the metal surface attracts atoms or molecules of various compounds from the external environment. Thus, the molecules of the compounds are adsorbed on the metal surface. Adsorption can be physical or chemical.

During chemical adsorption, the polar ends of p-arylsulfotrithiocarbonates bind to the metal surface. Under high temperature and pressure, trithiocarbonates decompose into smaller products such as sulfur, mercaptan, and trithiocarboxylic acid. It is logical to assume that the interaction of trithiocarbonates with the metal surface leads to the formation of brittle and easily degraded iron sulfides. These sulfides then react with the metal surface, forming a protective layer. Protective layers consist primarily of metal sulfides and oxides.

Studies of the tribological properties of *p*-arylsulfotritiocarbonates show that they possess superior extreme-pressure properties compared to xanthic acid esters. This can be explained by the higher sulfur content of trithiocarbonates, as illustrated in the figure 5.

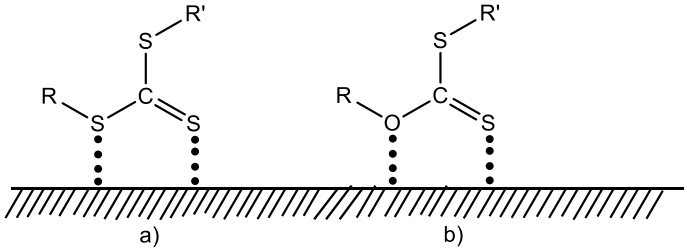


Figure 5. а) тритиокарбонат, б) ксантогенат

According to the geometry of the molecules under consideration, only two of the three heteroatoms can simultaneously participate in bonding with the metal surface during adsorption. It is logical to assume that molecules adsorbed by more electronegative oxygen will be more firmly retained on the surface and, consequently, will have superior antiwear properties. Thus, trithiocarbonic acid esters exhibit superior extreme pressure properties. However, they do not possess antiwear properties.

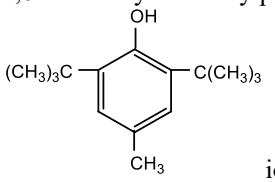
However, it should be noted that the synthesized bis(arylsulfo)trithiocarbonates have very limited solubility in mineral oils. Therefore, bis(toluenesulfo)trithiocarbonate was studied as a fuel antioxidant.

The antioxidant properties of the synthesized bis(toluenesulfo)trithiocarbonate were studied in the presence of the substance at a concentration of $5\cdot10^{-5}$ mol/L and during the autoxidation of isopropylbenzene - cumene as a model hydrocarbon at 110°C (Fig. 6). Peroxide radicals are the main factor determining the oxidation process of hydrocarbons. The reaction of the test compound with cumene peroxide radicals was studied. For this purpose, cumene oxidation with azoisobutyronitrile (AIBN) was initiated by introducing the test substance: T=60°C: [AIBN]= $2\cdot10^{-2}$ mol/L; [InH]= $5\cdot10^{-4}$mol/L (Fig. 7).

The results of the study of the kinetic parameters of bis(toluenesulfonyl)trithiocarbonate as an antioxidant are presented in Table 2.

Table 2

Antioxidant properties of bis(toluenesulfonyl)trithiocarbonate

Kimyəvi birləşmənin fotmulu	at 60°C		at 110°C
	f	$K_7\cdot10^{-4}$ *l/mol·s*	τ, minute
Bis(toluolsulfonyl)tritiokarbonat **(I)**	3,24	3,8	225
2,6-ditretbutyl-4-methylphenol  ionol (for comparison)	2,0	2,10	150

As follows from the data presented in Figures 6 and 7, the studied compounds effectively inhibit the oxidation process by reacting with cumene peroxide radicals.

The stoichiometric coefficient (τ) was calculated from the induction period $-f$, which is equal to the number of oxidation chains terminating on one inhibitor molecule and its transformation products:

$$f = \frac{\tau - W_i}{[I_n \cdot H]o}$$

where: Wi – initiation rate equal to 2·10-7 mol/(l-s), $[In\cdot H]_0$ – initial inhibitor concentration, mol/l.

To calculate the rate constant for the interaction of inhibitors with peroxide radicals $-K_7$, the oxygen uptake kinetic curves were transformed from $\Delta[O_2]$-t coordinates to $\Delta[O_2]$-t^1 coordinates and by the tangent of the slope angle equal to [19, 20]:

$$tga = \frac{f \cdot K_7 \cdot [I_n \cdot H]o}{K_2 \cdot [RH] \cdot W_i}$$

$$K_7 = \frac{tga \cdot K_2 \cdot [RH] \cdot W_i}{f \cdot [I_n \cdot H]o}$$

K_2 = 1.51 *l/mol·s*; [RH]=6.9 *mol/l*

From the values given in the table, it can be seen that the kinetic parameters of the obtained (bistoluenesulfo)trithiocarbonate in the reaction with cumyl peroxide radicals (f=3.24, K_7=$3.8\cdot10^{-4}$ l/mol°C) are higher than those of ionol (ionol parameters: f=2.0, K_7=$2.1\cdot10^{-4}$ mol °C), the induction time τ – 225 min, the induction time of ionol τ – 150 min.

The synthesized compound is an inhibitor with a combined effect: it repels cumyl peroxide radicals and breaks the oxidation chain. It also catalytically decomposes the cumyl peroxide formed during the reaction into molecular products.

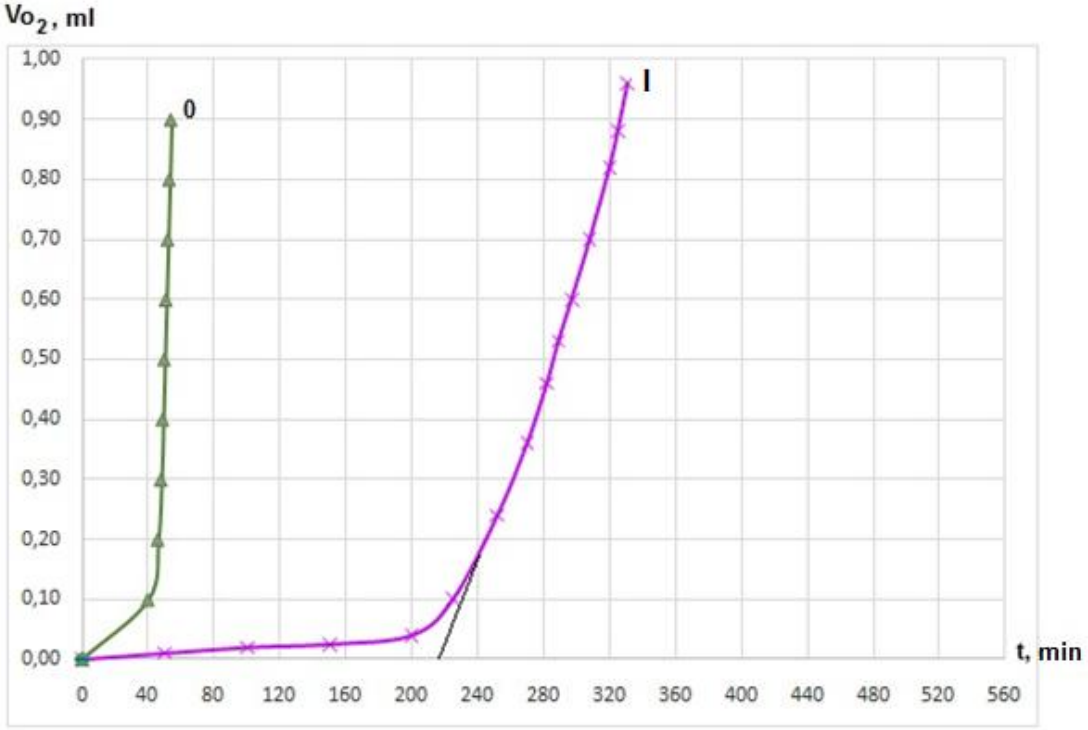


Figure 6. Kinetic curve of cumene autoxidation in the presence of (bistoluenesulfonyl)trithiocarbonate (I) (T=110°C; [In·H]=5·10-5 mol/L (curve 0 without inhibitor)

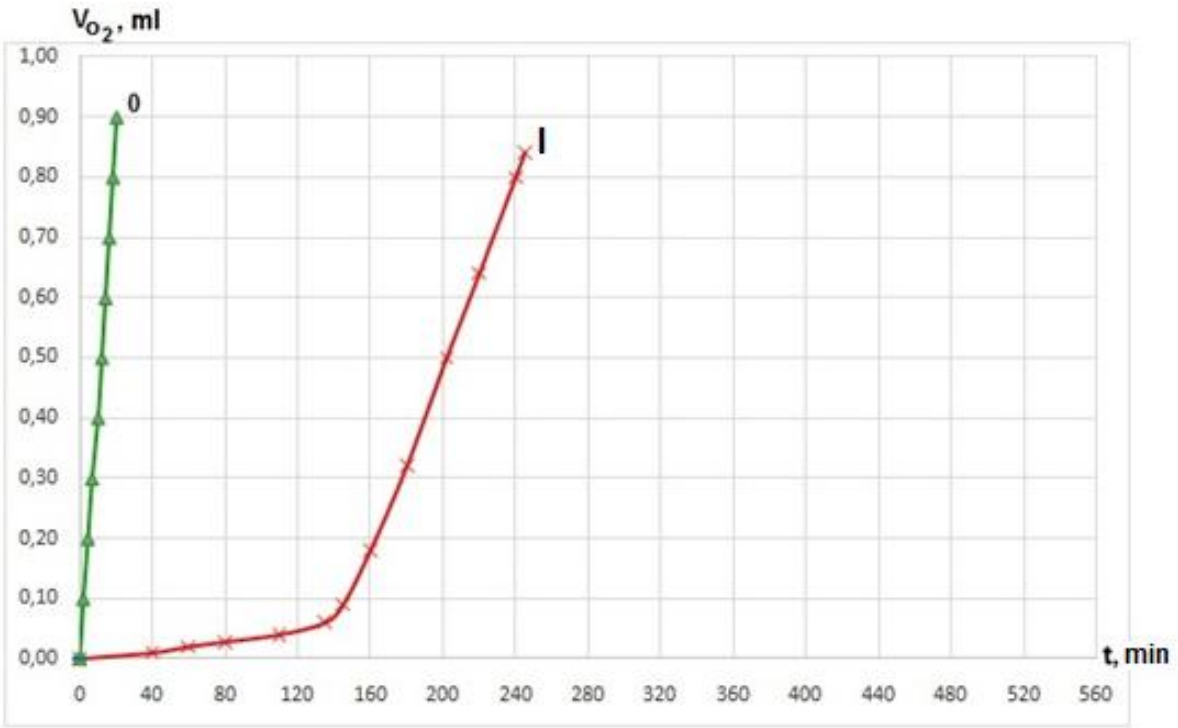


Figure 7. Kinetic curve of the initiated oxidation of cumene in the presence of (bistoluenesulfonyl)trithiocarbonate (I) (60°C.); [İn·H]= 5·10-4 mol/L; [AIBN] = 2·10-2 mol/l (curve 0 without inhibitor)

As mentioned, the task of antioxidants is to destroy peroxides, that is, to decompose them into inactive radicals. They neutralize free radicals by donating a portion of electrons. Antioxidant properties can be demonstrated by products of various classes of compounds, including organic sulfur compounds.

Sulfur antioxidants are a group of organic compounds that protect the environment from free radicals. These include substances such as mercaptans (R–SH), sulfides (R′–S–R), disulfides (R′–S–S–R).

It is known that sulfur-containing substances, including xanthates and trithiocarbonates, decompose at high temperatures into alkyl mercaptans, sulfides, disulfides, alkyl esters of thiocarboxylic acids, etc. [21]. The (bistoluenesulfo)trithiocarbonate purchased by us also decomposes into the above-mentioned active molecules and decomposes the peroxides formed in the fuel

into less reactive or inactive radicals, which, as a result, prevent the growth of the peroxide chain.

It should be noted that high levels of sulfides and mercaptans in fuel form sulfuric acids during its oxidation, which cause corrosion of engine parts. However, at low concentrations, these compounds greatly slow down the oxidation of fuel. Their mechanism of action is that these compounds primarily interact with the peroxides formed and decompose them [22].

Conclusion

A series of new sodium trithiocarbonate-based trithiocarbonate esters containing arylsulfo groups have been synthesized.

Preliminary tribological studies have demonstrated the potential for using displaced trithiocarbonate esters containing arylsulfo and allyl or benzyl radicals, respectively, as extreme pressure additives for lubricating oils.

These studies revealed that *p*-toluenesulfobenzyl and allyl trithiocarbonates possess high extreme pressure properties without possessing antiwear properties. However, the studies demonstrated the possibility of improving the antiwear properties of these compounds by formulating them with the well-known multifunctional additive DF-11.

Their extreme pressure effectiveness has been demonstrated to be superior to that of xanthic acid esters.

It has been found that bis(toluenesulfo)trithiocarbonate, which has limited solubility in lubricating oils, exhibits relatively high antioxidant properties in fuels.

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ECONOMIC SCIENCES

ANALYSIS AND RECOMMENDATIONS FOR ORGANIZATIONAL AND LEGAL MECHANISMS FOR THE REGULATION OF INTERNATIONAL TRADE

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ABSTRACT

This study is devoted to a comprehensive theoretical and empirical analysis of the organizational and legal mechanisms for regulating international trade in a globalized economy. Particular attention is paid to determining the role of key international institutions, such as the World Trade Organization (WTO), the United Nations Conference on Trade and Development (UNCTAD), the International Chamber of Commerce (ICC), as well as regional integration associations that form the modern architecture of the world trade system. Their impact on the unification of rules, harmonization of national legislative bases and reduction of trade barriers is analyzed. Additionally, the national legislation of individual states and its compliance with international standards are considered. The study assesses the main economic factors that determine Azerbaijan's foreign trade: import volumes, GDP dynamics, exchange rate fluctuations, foreign direct investment (FDI) inflows, changes in world oil prices and the level of customs tariffs. To verify the relationships between these factors, an empirical model based on panel data for 2010–2024 was used. The panel regression method with fixed effects was chosen, the adequacy of which was confirmed by the Hausman test.

The results showed that imports are the strongest factor influencing foreign trade turnover: a 1% increase in imports leads to an increase in trade volume by 0.87%. Gross domestic product and foreign direct investment have a positive and statistically significant effect, which indicates their key role in stimulating international trade relations. At the same time, the exchange rate and customs tariffs have a negative impact, reducing export competitiveness and complicating access to foreign markets.

In addition, it was found that a favorable trade policy, reflected in the form of a dummy variable, significantly increases trade turnover. World oil prices, taking into account the energy dependence of the Azerbaijani economy, also showed a statistically significant impact. The obtained value of the coefficient of determination R^2=0.78 confirms the high explanatory power of the model, which allows us to consider it suitable for predicting future trends in the field of foreign trade.

As a result, the study proves that the combination of liberal trade policy, deep customs reforms and maintaining macroeconomic stability creates favorable conditions for the effective integration of Azerbaijan into the international trade system. The results can be used both in scientific research and in the practice of state regulation, in particular for improving foreign economic policy strategies, optimizing the legislative framework and forming a more flexible model of cooperation with international economic institutions.

Keywords: International trade, organizational, legal, mechanism, import, export.

INTRODUCTION. In the globalizing world economy, international trade not only increases the interdependence of national economies but also plays a crucial role in their sustainable development. In the modern era, the deepening of economic ties among countries necessitates further improvement of the legal and organizational foundations of international trade [9, 2009]. The application of uniform norms and standards in the regulation of international trade ensures legal stability and transparency for market participants, while also preventing trade disputes. The World Trade Organization (WTO), UNCTAD, the International Chamber of Commerce (ICC), and other regional organizations (such as the European Union, NAFTA, ASEAN, etc.) are of particular importance in this process. The normative documents and arbitration mechanisms adopted by these organizations form the legal basis of international trade relations. At the same time, national legislation of countries – including customs regulations, licensing, and anti-dumping measures – plays a significant role in the practical implementation of international trade. The topic of organizational and legal regulation of international trade and its impact on the economic development of countries is one of the widely discussed areas in economic literature.

In terms of economic theory, the classical approach is based on the works of Adam Smith [14] and David Ricardo [12]. Their theories of absolute advantage and comparative advantage played a fundamental role in the justification of international trade. At a later stage, the Hecksher–Ohlin model explained the trade structure of countries based on the theory of the abundance of production factors [11].

Analysis of recent research and publications. Since the 20th century, new approaches have entered the theory of international trade. The “new trade theory” developed by Krugman (1979, 1980) showed that production is based on economies of scale, and at the same time, states can influence the market structure through trade policy [10; 11]. This approach revealed that international trade can be controlled not only by natural advantages, but also by organizational and legal mechanisms.

The legal and institutional framework of international trade is mainly determined by the rules of the World Trade Organization (WTO) and regional trade associations (EU, NAFTA, ASEAN, etc.). Researchers such as Bagwell and Staiger (1999, 2002) have shown that multilateral trade agreements serve to reduce trade disputes and deepen economic integration by harmonizing tariff policies between countries [6; 7].

Econometric assessment of factors affecting foreign trade is widely used in empirical studies. Frankel and Romer (1999) noted the positive impact of international trade on economic growth [8, p. 380]. On the other hand, Rodrik (2008) emphasized that economic policy instruments – tariffs, non-tariff barriers, exchange rate policy – directly affect the trade performance of countries [13, p. 370].

In the literature on Azerbaijan, the main directions are related to foreign trade policy, customs-tariff mechanisms and the impact of FDI flows on exports. Azerbaijan's international trade indicators and economic integration are regularly analyzed in reports by UNCTAD [16; 17], the World Bank [18; 19], and the International Monetary Fund [20]. Local researchers (Aliyev, 2018 [22]; Gasimov, 2020 [23]; Mammadov, 2022 [24]) show that liberalization of foreign trade policy, simplification of customs procedures, and stimulation of non-oil exports are important conditions for Azerbaijan's integration into the world economic system.

Thus, the existing literature shows that the development of international trade is regulated not only by economic regularities, but also by legal and institutional mechanisms. In the Azerbaijani context, the effectiveness of these mechanisms is closely related to the optimization of the country's trade policy and expanding access to international markets.

This article analyzes the organizational and legal regulation mechanisms of international trade from both theoretical and empirical perspectives. In particular, an econometric assessment of factors affecting Azerbaijan's foreign trade is conducted, and the effectiveness of the country's integration into the international trade system is measured. As a result of the research, the impact of trade policy, customs tariffs, exchange rates, and other macroeconomic indicators on foreign trade is substantiated with empirical models. The topic is relevant due to both its scientific and practical significance and its contribution to the formation of economic policy decisions. To address the main issue, we plan to conduct research in the following sequence:

- Econometric analysis of factors affecting Azerbaijan's foreign trade;
- Assessment of the impact of a 1% increase or decrease in imports on foreign trade;
- Assessment of Azerbaijan's integration into international trade through a favorable foreign trade policy.

Research Model and Main Objective: This section analyzes the main factors affecting Azerbaijan's foreign trade volume – import level, exchange rate, GDP, foreign investments, world oil prices, and customs tariffs – based on panel data. The objective is to quantitatively assess the impact of these variables on foreign trade turnover and empirically determine the effect of a 1% change in imports on overall trade.

The main purpose of the article is to analyze the organizational and legal mechanisms of regulting internationaltrade in Azerbaijan, to identify their stregths and shortcomings, to evaluate them in comparison with international practice and recommendations aimed at enhancing the effectiveness of the national trade policy and strengthening the countrys position I n theglobal economic system.

Analysis.The information basis used for the empirical analysis part of the research was formed based on both official statistical data and databases of international organizations. The data was mainly collected in a panel structure and covers the years 2010–2024. The main data sources and indicators used are presented below:

Table 1.

Azerbaijan's Foreign Trade Turnover and Import Volume (2010–2024, million USD)

Year	Foreign Trade Turnover	Import Volume
2010	21,768	6,689
2012	29,054	9,401
2014	31,980	10,207
2016	20,212	8,498
2018	30,924	11,464
2020	24,481	9,241
2022	45,783	14,732
2024	49,300	15,920

Source: Compiled by the author based on data from the State Statistical Committee of the Republic of Azerbaijan (SSCRA), the State Customs Committee (SCC), and the World Bank Open Data database.

Throughout the period of 2010–2024, Azerbaijan's foreign trade turnover exhibited an uneven but upward-trending pattern. Parallel to this, the import volume also increased, rising from $6.6 billion in 2010 to $15.9 billion in 2024[18].

Table 2.

Annual GDP and Foreign Exchange Rate (AZN/USD)

Year	Real GDP (million AZN)	USD/AZN Exchange Rate
2010	37,850	0.80
2014	59,014	0.78
2016	60,425	1.55
2018	67,289	1.70
2020	69,206	1.70
2022	76,158	1.70
2024	83,900	1.70

Source: Prepared by the author based on data from the State Statistical Committee of the Republic of Azerbaijan (SSC RA), the Central Bank of the Republic of Azerbaijan (CBAR RA), and the International Monetary Fund (IMF).

Following the 2015 devaluation, the exchange rate stabilized but remained at a higher level compared to previous years. Meanwhile, GDP has shown sustainable growth in recent years.

Table 3.

Foreign Direct Investments (FDI) and World Oil Prices

İl	FDI (mln USD)	Brent Oil Price (USD/barrel)
2010	1,815	79.5
2014	4,244	98.9
2016	3,102	44.2
2018	2,871	71.3
2020	2,328	41.9
2022	3,504	97.8
2024	3,800	85.0

Source: Systematized by the author based on data from UNCTADstat, World Bank, and IMF databases, and indicators from the Investment Promotion Agency (ARIPA) under the Ministry of Economy of the Republic of Azerbaijan.

Changes in world oil prices have significantly impacted FDI inflows and trade turnover [17] In 2014 and 2022, a rise in foreign investments was observed, paralleling the increase in oil prices.

Table 4.

Average Customs Tariffs and Trade Policy Dummy Indicator in Azerbaijan (2010–2024)

Year	Average Customs Tariff (%)	Trade Policy Dummy Indicator (1 = favorable, 0 = unfavorable)
2010	10.4	0
2012	9.8	0
2014	8.6	0
2016	7.1	1
2018	6.3	1
2020	5.5	1
2022	4.7	1
2024	4.2	1

Source: Calculated and interpreted by the author based on relevant decisions of the Cabinet of Ministers, and data from the State Customs Committee of the Republic of Azerbaijan, the World Trade Organization (WTO), and UNCTAD (2023).

From 2010 to 2024, average customs tariffs in Azerbaijan significantly decreased, and trade policy became increasingly liberal. Particularly after 2016, the dummy indicator was valued as "1" due to the strengthening of free trade agreements, customs concessions, and import facilitation measures. These changes increased Azerbaijan's integration into the global trading system and positively impacted overall trade turnover. [17;15]

To empirically evaluate the economic factors influencing Azerbaijan's foreign trade, a quantitative methodology, specifically econometric analysis of panel data, was applied. The advantage of panel data lies in its ability to combine time series and cross-section dimensions, enabling more stable and comprehensive results. The following key methodological approaches were utilized within the scope of this research:

The primary methodological framework applied in this study was panel regression models. These models are based on annual data covering the period 2010–2024 for different countries (Azerbaijan and its main trading partners).

The general form of the panel regression model is as follows:

$$Trade_{it}=\beta 0+\beta 1Import_{it}+\beta 2GDP_{it}+\beta 3ExchangeRate_{it}+\beta 4FDI_{it}+\beta 5OilPrice_{t}+\beta 6Tariffs_{it}+u_i+\epsilon_{it}$$

Where:

- i – country index;
- t – year;
- ui – fixed effects specific to individuals;
- ϵit – random error terms.

To determine the appropriate model, both Fixed Effects and Random Effects models were constructed. The Hausman test was applied to select which model was more suitable.

- If p-value < 0.05 → Fixed Effects is preferred.
- If p-value ≥ 0.05 → Random Effects is more appropriate.

The results of this test indicated that the Fixed Effects model is more efficient for panel data analysis. This allows for more effective modeling of time-invariant fixed factors within a country (e.g., legal environment, institutional structures).

The VIF test was conducted to determine the presence of multicollinearity among explanatory variables. If VIF < 5, there is no serious collinear relationship between the variables. In cases where VIF > 10, those variables were either transformed or removed from the model.

When working with panel data, the following tests were applied to check whether classical regression assumptions were violated:

- Breusch-Pagan test – to detect heteroskedasticity;
- Durbin-Watson test – to assess the likelihood of autocorrelation;
- Modified Wald test – to check for group-wise heteroskedasticity across the panel.

If violations were detected in these tests, corrections were applied using robust standard errors or clustered standard errors methods.

A Trade Policy Dummy variable was included in the model to account for the positive impact of Azerbaijan's liberal trade policy on overall trade volume during the years it was implemented (after 2016). This variable allows for an empirical evaluation of both the effect of policy initiatives and the role of institutional reforms.

The variables used in the model—imports, GDP, exchange rate, FDI, oil prices, and customs tariffs—are widely accepted in economic literature as key factors influencing foreign trade. The selection of these variables in the study considered both empirical experience and theoretical models (e.g., Heckscher-Ohlin and Mundell-Fleming).

These methods were used to achieve the following three main objectives:

-Quantify the impact and strength of factors affecting foreign trade.

-Analyze the impact of a 1% increase in imports on trade turnover.

-Evaluate the level of integration into international trade through the implementation of a favorable trade policy.

Based on the Fixed Effects panel regression model applied in the study, the main factors influencing Azerbaijan's foreign trade turnover were evaluated. In the model, foreign trade turnover (in million USD) was taken as the dependent variable, while import volume, GDP, exchange rate, FDI, oil prices, customs tariffs, and the trade policy dummy variable were used as explanatory variables.

Panel Model: Fixed Effects Regression (2010–2024) Dependent Variable: Foreign Trade Turnover (million USD) N = 8 countries × 15 years = 120 observations

Table 5.

Panel Regression Model Results

Variable	Coefficient (β)	T-stattat	Pvaluev	Description
Import	0.872	06.04	0.000	Statistically highly significant
GDP	0.435	2.98	0.004	Positive and statistically significant
Exchange Rate	-0.319	-2.57	0.012	Exchange rate increase reduces trade
Foreign Investment (FDI)	0.165	2.21	0.028	Investment growth supports trade
Oil Prices	0.082	1.39	0.167	Not statistically significant
Tariffs	-0.104	-3.02	0.003	Trade volume increases as tariffs decrease
Policy Dummy	0.511	4.67	0.000	Growth observed during favorable policy periods
R^2 (Coefficient of Determination)	0.78	–	–	High explanatory power of the model

Source: Author's empirical panel analysis results conducted in STATA software (Fixed Effects Regression, 2010–2024), with initial data sourced from the State Statistical Committee of the Republic of Azerbaijan (SSC RA), the State Customs Committee (SCC), the World Bank, the Central Bank of the Republic of Azerbaijan (CBAR RA), and UNCTAD.

Analysis and Interpretation of Main Results.

1. Impact of Imports (β= 0.872): Import volume is a key determining factor of foreign trade turnover. According to the model, a 1% increase in imports leads to an approximate 0.87% increase in foreign trade turnover. This result is both economically logical and statistically significant (p<0.01).

2. Impact of GDP (β= 0.435): The increase in GDP positively influenced foreign trade, as it expands

domestic consumption and production capabilities. This indicates that economic growth supports trade.

3. Impact of Exchange Rate (β= –0.319): An increase in the USD/AZN exchange rate (depreciation of the manat) negatively affects trade turnover. This is primarily linked to the increased cost of imports and a widening trade deficit.

4. Impact of FDI (β= 0.165): Foreign investments positively impact trade growth, as these investments are primarily directed towards export-oriented sectors.

5. Impact of Oil Prices (β= 0.082): Oil prices had a weak and statistically insignificant effect on trade. This suggests that Azerbaijan's trade structure has not yet fully transitioned to the non-oil sector.

6. Impact of Customs Tariffs (β= –0.104): As tariffs decrease, foreign trade turnover increases. This result demonstrates the effectiveness of Azerbaijan's liberal trade policy implemented since 2016.

7. Impact of Trade Policy Dummy (β= 0.511): Favorable trade policies (preferential tariffs, agreements, and reforms) significantly increased trade volume.

The results obtained indicate that:

- The strongest factors influencing foreign trade turnover are import volume and the applied trade policy.
- Economic and fiscal factors such as the exchange rate and customs tariffs had an uneven but noticeable impact.
- Structural reforms and the improvement of organizational mechanisms (policy dummy indicator) played a significant role in expanding foreign trade.

The model's $R^2 = 0.78$ indicates that these variables explain 78% of the variability in trade turnover. This demonstrates the model's strong statistical foundation and practical utility (Author's calculation, 2024; SSC RA; SCC; World Bank; CBAR RA; UNCTAD; Krugman, Obstfeld, & Melitz, 2018).

To determine the more appropriate form of the panel regression model, both Fixed Effects (FE) and Random Effects (RE) models were constructed, and their results were compared. The Hausman test was applied to select the statistically reliable model between them. The test result is as follows:

Table 6.

Hausman Test Results: Comparison of Fixed and Random Effects Models

Variable	Fixed Effects Coefficient (βFE)	Random Effects Coefficient (βRE)	Difference (βFE −βRE)
Import	0.872	0.911	–0.039
GDP	0.435	0.472	–0.037
ExchangeRate	–0.319	–0.265	–0.054
Foreign Investment (FDI)	0.165	0.132	0.033
Oil Prices	0.082	0.094	–0.012
Tariffs	–0.104	–0.077	–0.027
Policy Dummy	0.511	0.423	0.088

Source: Author's model selection analysis conducted in STATA software (Hausman **χ2**test, at 5% significance level).

Note: Hausman Test Statistic Value: **χ2(6)=14.73**P-value: 0.021Decision: Since the P-value < 0.05, the suitability of the Random Effects model is rejected. The Fixed Effects model is considered more efficient.

The results of the Hausman test indicate that statistically significant differences exist between the coefficients of variables in the Fixed and Random Effects models. These differences suggest that fixed effects – such as legal systems, institutional stability, and regional trade priorities – are not fully captured by the Random Effects model. Consequently, proceeding with the Fixed Effects model is more appropriate for the panel data structure and the objective of the research.

Table 7.

Multicollinearity Test – VIF Results

Explanatory Variable	VIF Value	1/VIF	Multicollinearity Level
Import	2.31	0.433	Low (acceptable)
GDP	2.75	0.364	Low–Medium
Exchange Rate	1.89	0.529	Low
Foreign Investment (FDI)	2.04	0.490	Low
Oil Prices	1.66	0.602	Negligible
Tariffs	1.92	0.521	Low
Policy Dummy	1.21	0.826	Very low – practically nonexistent

Source: Results of the VIF (Variance Inflation Factor) analysis from the panel model constructed by the author using STATA software.

Note: Average VIF: 2.11

The VIF values presented in the table are all below 5, indicating that a multicollinearity problem does not exist from a statistical and practical standpoint. The highest VIF value is 2.75, which is well below the accepted critical threshold (VIF < 5). This confirms the

model's stability and the absence of strong linear dependence among the explanatory variables. No harmful multicollinearity was observed among the variables used in the panel regression model, and all variables were retained in the model.

Table 8.

Heteroskedasticity and Autocorrelation Test Results

TestTest Namee	PurposePurpose	Test Statistict Statistic	-P-valuevalue	Decision
Breusch–Pagan Test	To check for heteroskedasticity	7.312	0.009	Heteroskedasticity is present
Modified Wald Test (groupwise)	Group-wise heteroskedasticity across panels	$\chi 2(8)=31.88$	0.000	Heteroskedasticity is present
Durbin–Watson Test (within)	Checking for autocorrelation (1st order)	DW = 1.39	–	Autocorrelation is likely present
Wooldridge Test (panel AR(1))	1st-order autocorrelation across panels	F(1,7) = 14.42	0.006	Autocorrelation is present

Source: Compiled by the author based on the results of Breusch–Pagan, Modified Wald, Durbin–Watson, and Wooldridge tests conducted in STATA software.

The test results indicate that both heteroskedasticity and autocorrelation are present in the panel data. This suggests that the classical OLS assumptions are violated. To ensure the reliability of the results, the following measures were taken:

- Robust standard errors (heteroskedasticity-consistent standard errors) were used.
- The clustered standard errors approach was applied to account for the grouped panel structure across countries.

These adjustments preserve the reliability of the standard errors and coefficients, thereby supporting the statistical interpretation of the model.

Table 9.

Impact of Trade Policy Dummy Variable on Foreign Trade

Model	Dummy Variable Coefficient (β)	T-stat	P-value	Economic Interpretation
Fixed Effects Panel Model	**0.511**	4.67	0.000	Favorable trade policy increases trade turnover
Random Effects Model	0.423	3.82	0.001	Same direction, but with weaker impact strength
Simplified OLS Model	0.465	3.54	0.002	Dummy effect is constant, but other factors are not considered

Source: Compiled by the author based on the results of Fixed Effects, Random Effects, and OLS models (covering 2010–2024 based on panel data).

Based on the results of the Trade Policy Dummy Variable's Impact on Foreign Trade test, we can note that:

- A dummy variable coefficient of

$\beta=0.511$

indicates that during periods when a favorable foreign trade policy (e.g., tariff reductions, new agreements, legal reforms, and electronic customs systems) was implemented, foreign trade turnover increased by an average of 0.511 units.

- The T-stat of 4.67 and

$p<0.01$

result signifies that this impact is highly statistically significant.

- For comparison, the dummy variable's impact was also positive and statistically significant in other models, but the most stable and strongest effect was observed with the Fixed Effects model.

A favorable trade policy is not only a legal reform effect but also a stimulus for economic activity, and this impact has been empirically proven based on panel data.

Conclusion and Generalization. The Fixed Effects panel regression model applied within this research covered annual indicators for Azerbaijan and its main trade partners from 2010–2024. This allowed for the quantitative assessment of key macroeconomic and institutional factors influencing foreign trade turnover.

The analyses yielded the following main generalized conclusions:

- Import volume acts as the primary shaping factor of foreign trade turnover. According to the model, a 1% increase in imports leads to an average 0.87% increase in total trade turnover, indicating Azerbaijan's import-dependent economic structure.
- An increase in Gross Domestic Product (GDP) positively influenced foreign trade volume. This shows that expanding domestic production and consumption capabilities supports international trade relations.
- An increase in the exchange rate (manat depreciation) negatively affected trade turnover. This demonstrates that exchange rate volatility is a key macroeconomic factor impacting the trade balance.

- Foreign Direct Investments (FDI) had a positive impact on foreign trade. As these investments primarily support export-oriented sectors, they serve as a crucial mechanism strengthening international trade operations.
- The impact of world oil prices was not statistically significant. This suggests that Azerbaijan's trade structure is gradually transitioning towards the non-oil sector.
- The reduction of customs tariffs led to an increase in foreign trade turnover. This proves that the liberal approaches and institutional reforms implemented in Azerbaijan's trade policy since 2016 have yielded positive results.
- The trade policy dummy variable included in the model (for years with favorable trade policy) had a high and statistically significant impact on foreign trade turnover. This variable empirically proved the effect of Azerbaijan's trade-oriented legal-organizational mechanisms and policy reforms on real economic indicators.

The results obtained across all models, confirmed by the Hausman test, indicated that the Fixed Effects model is more suitable for panel data. Additionally, the conducted VIF, Breusch–Pagan, Wooldridge, Durbin–Watson, and Modified Wald tests confirmed the model's technical adequacy and the reliability of its results.

The model's $R^2 = 0.78$ indicates that 78% of the variability in foreign trade turnover is explained. This demonstrates both the high statistical explanatory power of the constructed model and its capacity to serve as an effective decision-support tool at an applied level.

Ultimately, the research showed that economic and institutional policy changes play a crucial role in shaping Azerbaijan's foreign trade turnover. Creating a favorable trade environment, maintaining customs and currency stability, promoting investment, and implementing structural reforms can ensure the country's more effective integration into the international trade system.

Here's the translated "References" section, formatted to match an academic style:

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IMPROVING GREEN FINANCING MECHANISMS IN COMMERCIAL BANKS

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ABSTRACT

In the context of the global transition to a sustainable economic development model, commercial banks play a key role in mobilizing financial resources for environmentally oriented projects. Green finance is becoming an important tool for mitigating climate risks and stimulating sustainable investment. This article examines modern green finance mechanisms in commercial banks, analyzes international standards and practices for their application, and identifies the main challenges and limitations to the development of this area. Based on the analysis, directions for improving green finance mechanisms in banks are substantiated, aimed at increasing the efficiency of capital allocation, reducing greenwashing risks, and strengthening investor and borrower confidence.

Keywords: Green finance, commercial banks, sustainable development, green loans, green bonds, ESG, climate risks, greenwashing.

1. Introduction.

The modern banking system operates in a context of transformation of the global financial architecture, driven by increasing environmental and climate risks. Climate change, increasing anthropogenic pressure on the environment, and the need to decarbonize the economy are creating new demands on the operations of financial institutions, including commercial banks. In this context, green finance is becoming a priority area of banking activity, focused on supporting projects in renewable energy, energy efficiency, sustainable infrastructure, and environmentally friendly technologies. Commercial banks, with their significant lending potential and developed client base, are key intermediaries in the redistribution of financial resources in favor of sustainable projects.

However, the implementation of green finance in the banking sector faces a number of challenges, including insufficient standardization of green project evaluation criteria, limited environmental risk management tools, and the risk of financial products being unfairly marketed as "green". This necessitates improving green finance mechanisms in commercial banks, taking into account international experience and sustainable finance standards. The purpose of this article is to analyze existing green financing mechanisms in commercial banks and develop directions for their improvement in the context of sustainable development of the financial system.

2. Theoretical aspects of the research.

The term "green finance" began to emerge in the early 21st century, in an attempt to link business projects and environmentally responsible behavior by economic entities. However, the initial development of this new area of financing was relatively slow, given the traditional skepticism of much of society: human history offers few reasons to expect entrepreneurs to voluntarily constrain themselves by environmental regulations or sacrifice income for the sake of sustainable development goals.

PK Ozili's approach to green finance is based on its ability to accumulate capital for environmentally significant projects that provide both financial returns and environmental conservation[1]. Y.Wang and Q.Zhi define the essence of "green" finance as the integration of environmental protection objectives and the achievement of economic benefits[2]. S.Bahl views green finance as the financing of environmentally friendly activities, green technological solutions and projects, as well as projects to minimize environmental damage[3]. X.Zhou, X.Tang, R.Zhang define green finance as the process of using financial resources to finance projects and enterprises that have a positive impact on the environment and society as a whole, including in the areas of ecology, energy, sustainable development and climate solutions[4]. D.Klein views green finance not only from the perspective of positive environmental impact, but also as an effective tool for achieving financial profit[5]. The "green" financing mechanism refers to a set of methods for organizing financial and economic relations between entities within the framework of the "green" financing instrument.

[1]Ozili P.K. Digital finance, green finance and social finance: Is there a link? / P.K.Ozili // Financial Internet Quarterly. No. 17. P. 1-7. ISSN 2719-3454.

[2]Wang Y. The role of green finance in environmental protection: Two aspects of market mechanism and policies / Y.Wang, Q.Zhi // Energy Procedia. 2016. No. 104. P. 311-316. ISSN 1876-6102.

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[5]Klein D. The Paris Agreement on Climate Change: Analysis and Commentary/D.Klein. Oxford: Oxford University Press, 2017. 447 p. ISBN 978-0-19-880376-8.

1-table.

Categories of green financing instruments[6]

Green finance instruments			
Traditional instruments		Innovative tools	
Green bonds	Green loans	Green crowdfunding, crowdlending, crowdinvesting	Green venture capital investments
Green grants	Green subsidies		
Green loans	Syndicated green loans		
Green Mutual Funds	Investment tax credit		
Budgetary investments	Green certificates		

Green finance in Uzbekistan is in its infancy and faces a number of significant challenges, including an insufficient legal framework, limited financial incentives for private investors, and a lack of knowledge and experience among key players. However, with political will and the active participation of international partners, all the prerequisites are in place to overcome these obstacles. Developing green finance in Uzbekistan will require a comprehensive approach, including improving the legislative framework, creating incentive mechanisms for private investors, and raising awareness and skills among all stakeholders.

Improving mechanisms for balancing incentives and stop factors in the use of market-based green financial instruments. Increasing the importance of the green standards system with increased government oversight of financial institutions and improved reporting transparency requirements. Creating a platform for exchanging credit information on green projects for Chinese manufacturing entities. Emphasis is placed on expanding communications between regions, which will allow for synergies in the approved financial policies in the provinces. International cooperation and capital inflow. Given the rapid development of global green finance, China is actively strengthening cooperation in the field of green financial standards. For example, China and the European Union are already cooperating in the field of green finance. Both sides are striving to create a unified international system of green financial standards[7].

3. Methodological aspects of the research.

The methodological basis of the study is based on general scientific and specialized methods of analyzing economic processes. The study utilized methods of analysis and synthesis, induction and deduction, and a systems approach, which allowed for the examination of green finance mechanisms as an element of a comprehensive banking management system[8].

A comparative analysis was used to study international practices of green banking finance and compare approaches used in countries with developed financial infrastructure[9]. Economic and statistical methods were used to analyze data on the growth of green loans and bonds in the banking sector. An institutional approach allowed us to assess the impact of international ESG standards and regulatory requirements on the development of green finance banking mechanisms. The research's information base included reports from international financial institutions, regulatory documents, and scientific publications by international researchers.

4. International experience of the research.

International experience in implementing and developing green finance in commercial banks demonstrates a diversity of approaches, tools, and strategies aimed at integrating ESG criteria and sustainable practices into banking activities.

One of the key global initiatives is the Alliance for Green Commercial Banks, an international platform created with the participation of the International Finance Corporation (IFC, part of the World Bank). The association brings together commercial banks from various countries seeking to integrate sustainable finance into their business models, share best practices, and develop projects in the area of climate solutions and economic adaptation to climate change. This cooperation demonstrates banks' growing commitment to the transition to sustainable growth and is consistent with international green finance standards[10]. Green financial products are also actively developing in banking practices in some countries. For example, New Resource Bank (USA) specializes in lending to companies that contribute to sustainable development and environmental initiatives, focusing its loans exclusively on sustainable business models and environmentally sound projects[11].

Sustainable banking lending is also gaining significant momentum in Europe. Triodos Bank (Netherlands) follows strict environmental criteria when selecting projects, financing only those initiatives deemed environmentally friendly and socially responsible, excluding companies with a high negative environmental impact[12]. Another example is Commerzbank (Germany), which not only finances green projects (including through the issuance of green bonds), but also implements a policy of phasing out financing from the

[6]Anton Vyacheslavovich Piskarev, "Transformation of Green Financing Mechanisms to Ensure National Environmental Well-Being", dissertation for the degree of Candidate of Economic Sciences, Moscow, 2025.
[7]https://www.climatepolicyinitiative.org/publication/green-banking-in-china-emerging-trends/
[8]OECD. Developing Sustainable Finance Definitions and Taxonomies, Paris, 2021.
[9]International Capital Market Association (ICMA). Green Bond Principles, London, 2023.
[10]Alliance for Green Commercial Banks: Supporting Sustainable Banking and Climate Finance, Washington, DC: World Bank Group, 2025. (https://www.ifc.org/en/pressroom/2025/ifc-s-alliance-for-green-commercial-banks-welcomes-20-banks-to-support-sustainable)
[11]New Resource Bank (URL:https://en.wikipedia.org/wiki/New_Resource_Bank)
[12]https://en.wikipedia.org/wiki/Triodos_Bank

coal industry and uses science-based approaches to decarbonize its investment portfolio[13]. In Asia, commercial banks are also actively developing green products. Sustainable finance programs, such as the Bank of the Philippines' (BPI) Sustainable Energy Finance (SEF), include support for renewable energy and energy efficiency projects, as well as the development of environmental and social risk management standards[14].

2-table.

International experience of green financing in commercial banks[15]

Country / Region	Commercial bank	Main mechanisms of green financing	Results and Features
EU (Netherlands)	Triodos Bank	Green lending, strict ESG screening of projects	Only environmentally and socially sustainable projects are financed.
EU (Germany)	Commerzbank	Green bonds, divestment from coal financing	Reducing the carbon footprint of the loan portfolio
USA	New Resource Bank	Green loans, sustainable corporate finance	Supporting small and medium-sized businesses in the field of sustainable development
China	State-owned commercial banks	National Green Taxonomy, preferential green lending	Growth in green loans and government support for renewable energy projects
Developing countries	Bank members of the Alliance for Green Commercial Banks	ESG integration, climate finance	Expanding access to green financial instruments

Furthermore, the experience of large banking groups, such as the implementation of strategic climate partnerships by players such as BBVA, points to a trend towards closely integrating sustainable finance and climate change strategies into the corporate strategies of global financial institutions[16]. Thus, international practice shows that commercial banks are using a full range of green financing instruments from specialized green loan products and green bonds to the implementation of sustainable risk management standards and participation in global alliances supporting sustainable finance. These approaches contribute to the expansion of commercial banks' role in mobilizing private capital for environmental projects and strengthening the global financial transition to sustainable development.

5. Analysis and results of the research.

The analysis showed that commercial banks currently use the following main mechanisms of green financing: green lending, issuance and placement of green bonds, project financing of environmental initiatives and the introduction of ESG criteria into lending policies[17]. The most common instrument is green lending, which focuses on financing energy-efficient projects and renewable energy sources. However, the lack of uniform criteria for assessing the environmental sustainability of projects leads to increased operational and reputational risks for banks. In this context, the application of sustainability taxonomies and disclosure standards helps improve the transparency of banking operations.

The research's findings demonstrate that integrating ESG factors into credit analysis and risk management processes enables commercial banks not only to mitigate climate and transition risks but also to enhance long-term financial resilience. However, developing economies face limitations related to insufficient institutional support and a shortage of qualified green finance professionals.

6. Conclusion.

The study found that improving green financing mechanisms in commercial banks is an objectively necessary condition for ensuring the sustainable development of the modern financial system in the face of increasing climate and environmental challenges. Commercial banks, as key financial intermediaries, possess significant potential for mobilizing and redistributing financial resources toward environmentally sustainable and socially significant projects.

The effective use of green financial instruments, including green lending, the issuance and placement of green bonds, and the integration of ESG criteria into credit analysis and risk management processes, contributes to a more rational capital allocation and the mitigation of systemic climate risks. Integrating environmental factors into banking operations allows for the consideration of the long-term consequences of investment decisions and increases the resilience of banking portfolios to the risks of the transition to a low-carbon economy. The research's results also demonstrate that international experience confirms the high effectiveness of a comprehensive approach to developing green

[13]https://en.wikipedia.org/wiki/Commerzbank

[14]Sustainable finance: Greening the banking sector, Manila, 2024. URL:https://www.bworldonline.com/opinion/2024/10/11/627075/sustainable-finance-greening-the-banking-sector/

[15] Prepared by author.

[16]BBVA and KKR form climate-focused strategic partnership, London, 27 September 2024.URL:https://www.reuters.com/sustainability/sustainable-finance-reporting/bbva-kkr-form-climate-focused-strategic-partnership-2024-09-27/

[17]World Bank. Green Finance and Banking Report, Washington, DC, 2023.

finance, combining market mechanisms, voluntary standards, and regulatory instruments.

At the same time, it was revealed that the further development of green finance in commercial banks requires institutional support, improved regulatory frameworks, and the development of a unified methodological approach to assessing the environmental sustainability of projects. Of particular importance is the development of human capital and digital monitoring and reporting tools to improve the transparency and comparability of green finance transactions.

Improving green finance mechanisms in commercial banks not only contributes to achieving environmental and climate goals, but also creates the conditions for long-term financial stability, increased investment attractiveness of the banking sector, and sustainable economic growth overall.

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GEORGIA'S AGRICULTURAL INSURANCE MARKET AND DEVELOPMENT PROSPECTS

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ABSTRACT

Agricultural insurance represents one of the key mechanisms ensuring the sustainable development of agriculture and the financial stability of farmers. In Georgia, the state-subsidized agricultural insurance program has been in operation since 2014 and covers risks such as hail, storms, excessive precipitation, and early autumn frost. The state-subsidized program implemented since 2014 has made a significant contribution to the establishment of a risk management system in the sector and to raising farmers' awareness.

However, the agricultural insurance system is still in a stage of development and requires further improvement at the institutional, technical, and organizational levels. The main challenges remain the low coverage of the program, the insufficient number of meteorological stations, and the geographical concentration of insured land plots in high-risk regions. This trend creates the risk of adverse selection and limits the even nationwide dissemination of the agricultural insurance program.

Overcoming these challenges requires close cooperation between the public and private sectors, the harmonization of agricultural insurance policy and practice, the introduction of a unified damage assessment methodology, and the strengthening of farmer awareness and information. In addition, it is advisable to develop new insurance products and financial incentives, taking regional specificities into account, which would encourage the involvement of small and medium-sized farmers in low-risk regions as well.

Such an approach will contribute to the comprehensive development of the agricultural insurance system, ensure the economic security of farmers, and enhance the competitiveness of the agricultural sector, which ultimately constitutes a foundation for the country's economic sustainability.

Keywords: risk, insurance, agricultural insurance, agriculture, state, private sector.

Human daily life and activities continuously involve various types of risks and the probability of unforeseen events. Despite the modern achievements in the development of science and technology, there still exist circumstances that pose serious challenges to individuals. Among these, natural disasters are particularly noteworthy, as they often cause significant damage and can substantially affect a person's socio-economic condition. Under such conditions, the need for protective mechanisms that ensure the continuation of life with minimal losses and the maintenance of economic stability becomes increasingly important.

Insurance represents one of the most widespread and effective financial instruments for risk management. Agricultural insurance enables farmers to protect their crops against various risks and to avoid financial losses.

In Georgia, a subsidized agricultural insurance program based on cooperation between the public and private sectors has been in operation since 2014 and aims to ensure farmers' financial stability and the sustainability of agriculture.

Due to the specific geographical location of Georgia's territory and its complex relief, various types of natural hydrometeorological processes frequently occur, among which hail is particularly significant. In this regard, the Kakheti region stands out, where hail often causes damage to the region. The damage caused by hail amounts to millions of GEL annually. Accordingly, it is natural that among the named risks covered under the agricultural insurance program, hail represents one of the most important types of coverage. It should be noted that more than half of the insured plots are concentrated in the Kakheti region. According to 2024 data, within the framework of the agricultural insurance program, 79% of insured land plots are insured in Kakheti, while 69% of insured plots are vineyards.

Within the framework of the program, insurance coverage, in addition to hail, includes such major risks as storms, excessive precipitation, and early autumn frost (only for citrus crops).

Based on the program's outcomes, its conditions are refined and clarified, and changes are implemented almost every year. The definition of the deductible (franchise) has been clarified; a unified damage assessment standard (for certain crops) has been developed for all insurance companies participating in the project; reporting procedures and deadlines have been improved; normative yields, tariffs, and the co-financing percentage have been reviewed and specified; and three-year insurance for perennial crops has become possible. In addition, continuous video recording and audio recording using body-worn cameras during the process of describing an insured event have been made mandatory.

Despite the progress achieved, the agricultural insurance system continues to face significant challenges. Although the share of agricultural insurance in the insurance market has been increasing from year to year, it remains very small and in 2024 accounted for only 1.57% of the total insurance market.

Low coverage remains one of the main challenges of Georgia's agricultural insurance system and significantly limits the effectiveness of the program. Despite the fact that the state-subsidized agricultural insurance program has been operating since 2014 and provides farmers with the opportunity to protect their crops against various types of risks, its geographical and sectorial coverage remains limited. The number of insured

plots constitutes only a small share of the country's total agricultural land, indicating both a lack of information and low farmer motivation to participate in the program. One of the reasons for low coverage is the insufficient meteorological infrastructure—specifically, the limited number of meteorological stations—and issues related to the accuracy of the data obtained from them. Accurate meteorological data form the foundation of the agricultural insurance system, as damage assessment directly depends on such data. From the launch of the program through 2024, the number of insured plots is distributed as follows.

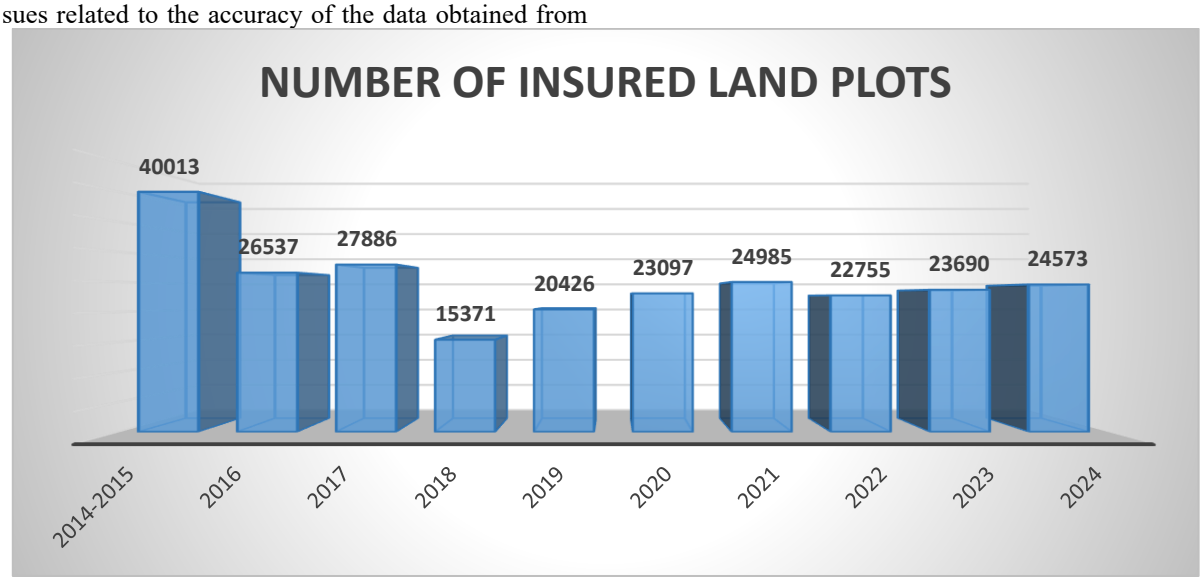

Diagram №1.

The amendment implemented in 2018, according to which only land plots registered with the National Agency of Public Registry were eligible for insurance, resulted in a 45% decrease in the number of insured land plots.

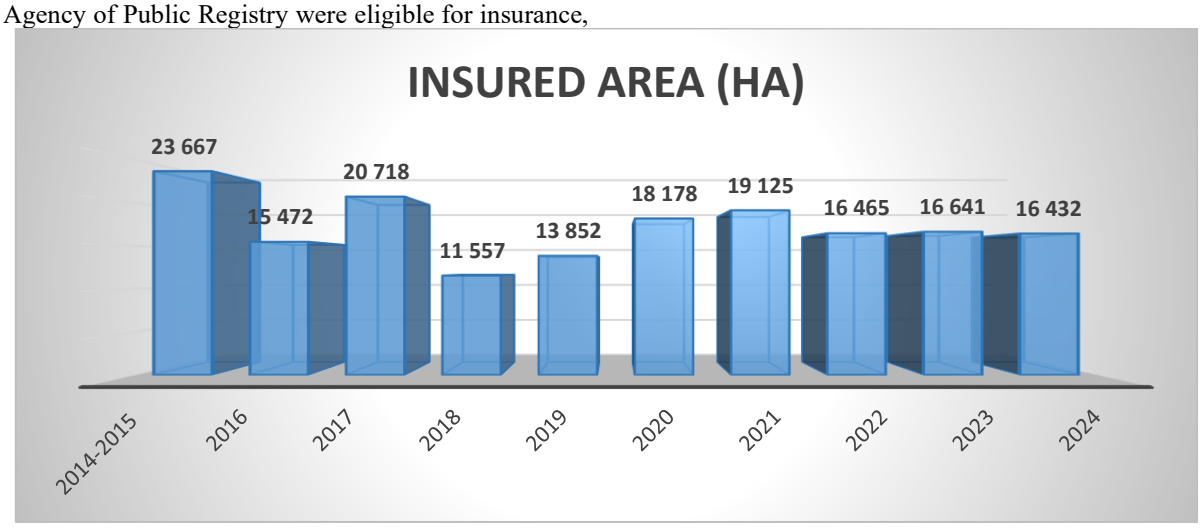

Diagram №2.

Adverse selection remains a significant challenge. One of the most illustrative examples of adverse selection in Georgia's agricultural insurance program is the uneven geographical distribution of insured plots. According to available data, more than half of the insured plots are concentrated in only three regions—Kakheti, Shida Kartli, and Kvemo Kartli—out of Georgia's 12 regions. This fact clearly indicates that interest in agricultural insurance is predominantly expressed by farmers operating in high-risk areas, where hail, strong winds, and excessive precipitation are frequent and the probability of crop damage is high. Consequently, in lower-risk regions, such as Imereti, farmers' interest in insurance is significantly lower, which disrupts the spatial balance of the program and increases the risk of adverse selection. This trend underscores the need for the state and the private sector, through close cooperation, to develop additional incentives and mechanisms that would encourage farmers in low-risk regions to participate in the agricultural insurance system as well, thereby ensuring geographical diversification of the program and promoting the sustainable development of the sector.

Since the inception of the program and up to 2024, insurance companies have compensated losses totaling over 92 million lari, while aggregate gross premiums during the same period exceeded 135 million lari.

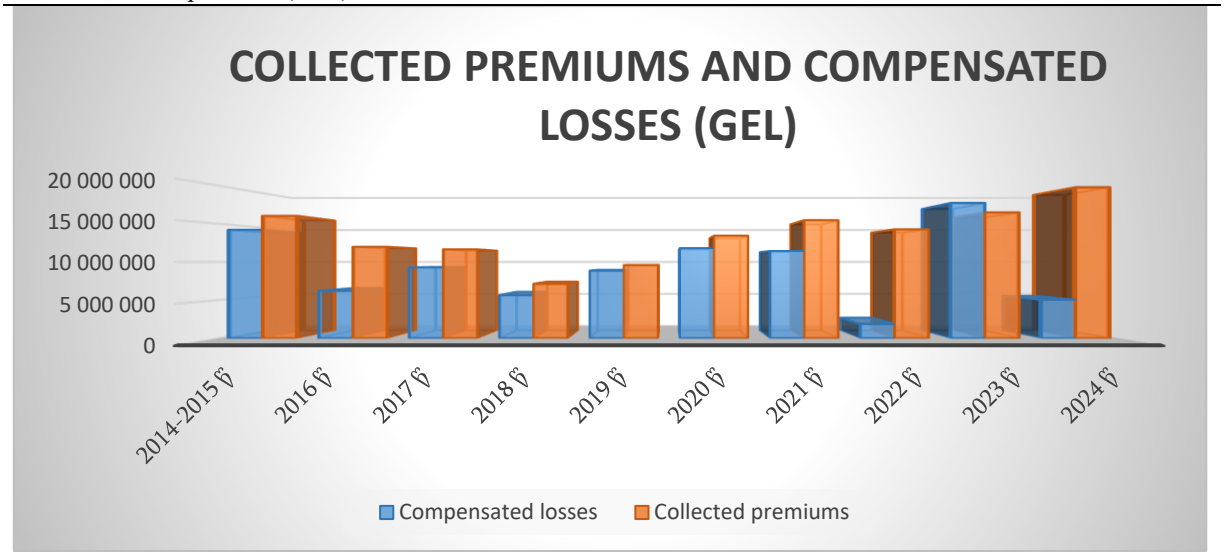

Diagram №3.

Agricultural insurance in Georgia represents one of the key mechanisms for ensuring the sustainable development of agriculture, the financial stability of farmers, and social protection. The agricultural insurance program, introduced by the state in 2014, has played a significant role in establishing a risk management system within the agricultural sector and raising farmers' awareness. Despite the results achieved, the program is still in a developmental stage and requires improvement at administrative, technical, and institutional levels. One of the main challenges remains low coverage and the limited number of meteorological stations. In addition, insured plots are primarily concentrated in a few high-risk regions, particularly Kakheti, where hail and other natural disasters are frequent. Such geographical imbalance has increased the risk of adverse selection—farmers in low-risk regions show less interest in insurance, which disrupts the equitable and effective distribution of the program nationwide. In this context, it is advisable, taking regional specificities into account, to develop new insurance products and mechanisms, which requires close cooperation between the public and private sectors. It also necessitates strengthening informational, technological, and financial mechanisms. Only through these measures will it be possible to enhance the agricultural insurance system, ensure farmers' economic protection, and increase the competitiveness of the agricultural sector in the face of global climatic and economic changes, which, ultimately, forms the foundation for the country's economic sustainability.

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CHALLENGES AND OPPORTUNITIES OF THE CIRCULAR ECONOMY IN GEORGIA

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ABSTRACT

The subject of our research is, on the one hand, the challenges of the circular economy and, on the other hand, the possibilities for its development and improvement in Georgia.

In this paper, we examine the circular economy as an economic model that radically changes the paradigm of resource use and consumption and creates opportunities for the efficient use of material and financial resources.

Since the population is actively involved in circular economic relations, it has a clearly defined social character and is oriented toward enhancing public welfare and improving living conditions.

Our research has shown that today, due to the high economic activity of businesses, the large volume of industrial and household waste in industrialized countries pollutes the soil and atmosphere, creating the basis for epidemics and ecological disasters.

In Georgia as well, the role and function of the circular economy are increasing. The imperatives in the economy are changing, requiring the transformation of stereotypes formed within our economic system, which should be followed by serious adjustments to the existing economic paradigm of Georgia.

During the research process, the emphasis was placed on the current state of the circular economy in Georgia and the problems that hinder its development.

The aim of the study is to demonstrate the necessity of implementing the circular economy in Georgia and the prospects for its future development.

Keywords: circular economy, implementation, waste management, social responsibility, ecological environment.

The circular economy is an economic model in which not only the secondary use of goods already consumed is carried out, but an innovative waste-management system is introduced. It implies the reuse, restoration, and recycling of waste, materials, and products through the use of modern, advanced technologies.

The circular economy provides a unique opportunity to increase production volumes without increasing the expenditures associated with it. Since the population is actively involved in the process of waste collection alongside businesses, such an economic model has a clearly expressed social vector and is oriented toward raising public welfare and improving living conditions.

The circular economy should be viewed as an economic model that radically changes the paradigm of resource use and consumption and aims at the efficient use of material and financial resources and opportunities.

By its immanent nature, the circular economy is purposeful, as it establishes the principles of economy and saving in the distribution of resources and enhances positive waste-management practices within the civil sector.

Traditional economies have been based for centuries on the excessive use of natural resources and energy — according to the principle "take and use," which causes enormous harm to natural and energy resources and to countries' ecological systems.

The efficiency of the circular economy lies in maximally reducing the volume of waste, increasing the lifespan of produced goods, and conserving nature.

Ecological problems in many countries around the world have revealed the dangers — especially in land use — that arise from the irrational consumption of land.

The prominent French public figure and philosopher Jean-Jacques Rousseau, in his historical treatise *The Social Contract, or Principles of Political Right* (1762), notes that "humanity would have avoided many wars, crimes, and murders if the first person who fenced off a piece of land and said 'this is mine' had been told 'no,' because in his view, the wealth derived from the land belongs to everyone, while the land itself belongs to no one."[18]

We believe that this idea expressed by Rousseau in the 18th century should often be reminded to the governments and landowners of those countries that relentlessly exploit land resources and cause tremendous harm to nature and the environment.

In the era of global warming and climate crises, the circular economy changes economic approaches. The principle of "reducing waste and increasing its reuse" becomes established. Such an economic model preserves the environment, reduces the demand for new raw materials and resources, and contributes to the creation of new jobs. The circular economy represents a civilizational choice for countries, based on the principle: "live frugally and create more wealth."

Today, due to the high economic activity of businesses, the large volume of industrial and household waste in industrial countries pollutes the soil and atmosphere, which becomes the basis for epidemics and ecological disasters.

The role and function of the circular economy are increasing in saving and managing energy resources, since new concepts of urban development are formed

[18] David Vekua, Alexandre Taliashvili – On the Need for Legal Regulation of the Economy in Georgia – Journal "New Economist," 2024, p. 26.

during the design and construction of buildings, enterprises, and cities.

According to 2024 indicators, *"the circulation rate in Georgia's economy amounted to 1.3%, which means that Georgia's economy is predominantly linear in nature and requires substantial modernization in this direction, as the majority of consumed resources are of primary origin."[19]

Georgia's integration into the global economy requires a more active implementation of circular economy principles and stronger governmental encouragement of circular economy models within the business sector.

One of the key tasks for the successful implementation of the circular economy is the introduction of positive waste-management practices in the country. In this regard, Sweden stands out, *"where only 1% of waste ends up in landfills annually, while the rest is either recovered or recycled. Waste-recycling rates are also high in Austria (63%), Germany (62%), Taiwan (60%), Singapore (59%), the United Kingdom (50%), and others."[20]

Waste recycling, secondary use of resources, extending product lifespans, and introducing zero-waste technologies are not merely fashionable trends — for Georgia, these should become important factors for economic growth. To address this challenge, Georgia adopted the **Waste Management Code** in 2018, which opened the possibility for the circular economy to move to a new stage of development. The will of the Georgian government is undoubtedly important, but even more important is public support for the implementation of this will.

At this stage, Georgia's municipal waste collection, recycling, and disposal systems require substantial reforms and alignment with international requirements and standards. *"Using the calculated waste-generation index, the amount of municipal waste generated in cities and rural settlements in 2020 averaged 0.95 kg per capita per day in urban areas (excluding tourists) and 0.54 kg per capita per day in rural areas. The total amount of municipal waste generated in 2020 was 1,061,007 tons, of which 760,942 tons originated in cities and 300,065 tons in rural areas. In 2021, total municipal waste generation amounted to 1,104,952 tons — 768,257 tons in cities and 336,695 tons in rural areas."[21]

Waste-composition analysis conducted during the same period to determine the typical structure of generated waste streams shows that:

*"municipal waste consists of organic waste (54.7%), plastic (13.8%), paper and cardboard (10.6%), textiles (4.1%), construction and demolition waste (2.5%), glass (2.3%), metals (1.4%), and other waste (11%)."[22]

As these indicators show, Georgia's waste stream contains a large share of organic and recyclable materials, which creates favorable conditions for their circular use and recovery.

Introducing modern methods for the recycling and utilization of plastic waste is one of the major global challenges from an environmental standpoint. *"Each year, approximately 300 million tons of plastic waste accumulate worldwide. Notably, only 9% of this waste has been recycled, 12% is incinerated, while the remaining 79% ends up in landfills. Considering that plastic production and consumption are expected to increase even further, it can be assumed that the environmental situation will continue to worsen."[23]

Plastic waste management is also one of the major problems for Georgia. *"The population of Georgia generates an average of approximately 29,000 tons of plastic waste annually, which accounts for 14.9% of total waste."[24]

Waste management in Georgia is linked to numerous challenges, as the waste-collection system is not developed to a sufficient degree, particularly in rural areas. Consequently, many people dispose of waste in improvised dumpsites, rivers, or gorges.

For the successful implementation of the circular economy in Georgia, it is essential to have a coordinated action strategy between the government and society — a strategy tailored to the country's needs and capacities.

The economic growth and creation of new jobs resulting from circularity in Georgia must not harm the ecological environment, as environmental protection is a prerequisite for establishing this type of economic model.

Improving the recycling of municipal solid waste is also of critical importance, as unsystematic use of landfills still remains common practice in Georgia.

It is also crucial to increase energy efficiency in businesses in Tbilisi and other major cities, improve land and water resource management, and enhance material productivity.

Circular innovation is a necessary component for creating a strong and innovative national system, one that bases its production and service processes on the principles of the circular economy. Equally important for implementing a circular economy is the establishment of a circular culture — turning circular habits and practices into social norms. Achieving this is possible only through improved education and qualifications in this field, public-information campaigns, and activities aimed at increasing transparency and monitoring.

Introducing circular regulations in Georgia requires the formation of a corresponding legislative framework that will consider: expanding the assortment

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[21] National Waste Management Strategy of Georgia 2016–2030, p. 7

[22] National Waste Management Strategy of Georgia 2016–2030, p. 7

[23] ISET Economists – G. Lobzhanidze, N. Piniati, "How Should Georgia Manage Plastic Waste?" https://iset-pi.ge/ka/blog/66-rogor-unda-gaumklavdes-saqartvelo-plastmasis-narchenebs

[24] ISET Economists – G. Lobzhanidze, N. Piniati, "How Should Georgia Manage Plastic Waste?" https://iset-pi.ge/ka/blog/66-rogor-unda-gaumklavdes-saqartvelo-plastmasis-narchenebs

of goods produced by businesses; promoting the reuse and recovery of waste; encouraging waste separation at the source; ensuring management infrastructure; developing regenerative agricultural production; and expanding secondary markets for local materials.

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ВЛИЯНИЕ ФОРВАРДНЫХ КОНТРАКТОВ С ОТЛОЖЕННЫМ ЦЕНООБРАЗОВАНИЕМ НА ФИНАНСОВУЮ УСТОЙЧИВОСТЬ И ИНВЕСТИЦИОННУЮ АКТИВНОСТЬ АГРОХОЛДИНГОВ

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THE IMPACT OF FORWARD CONTRACTS WITH DEFERRED PRICING ON THE FINANCIAL STABILITY AND INVESTMENT ACTIVITY OF AGRICULTURAL HOLDINGS

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АННОТАЦИЯ

В статье рассматривается влияние форвардных контрактов с отложенной фиксацией цены на финансовую устойчивость и инвестиционную активность агрохолдингов в условиях высокой ценовой неопределённости и удорожания финансовых ресурсов. Показано, что рассматриваемая контрактная конструкция обладает двойственным эффектом: с одной стороны, она повышает гибкость управления моментом фиксации цены и может улучшать прогнозируемость денежных потоков, с другой стороны – сохраняет ценовой риск у продавца после передачи продукции и усиливает кредитную и ликвидностную экспозицию к контрагенту. Эмпирическая часть исследования опирается на анализ публичной финансовой отчётности крупных международных агропромышленных групп и открытых рыночных индикаторов. Практическая значимость работы состоит в формировании управленческих рекомендаций по контрактному дизайну, лимитированию открытой ценовой позиции, контролю стоимости удержания позиции и снижению кредитного риска контрагента для поддержания платёжеспособности и устойчивости инвестиционных программ.

ABSTRACT

The article examines the impact of forward contracts with deferred price fixing on the financial stability and investment activity of agricultural holdings in conditions of high price uncertainty and rising cost of financial resources. It is shown that the contract design under consideration has a dual effect: on the one hand, it increases the flexibility of managing the moment of price fixing and can improve the predictability of cash flows, on the other hand, it preserves the price risk of the seller after the transfer of products and enhances credit and liquidity exposure to the counterparty. The empirical part of the study is based on an analysis of the public financial statements of large international agro-industrial groups and open market indicators. The practical significance of the work consists in the formation of management recommendations on contract design, limiting an open price position, controlling the cost of holding a position and reducing the counterparty's credit risk to maintain solvency and sustainability of investment programs.

Ключевые слова: агрохолдинги, форвардные контракты, отложенная фиксация цены, ценовой риск, кредитный риск контрагента, риск ликвидности, оборотный капитал, финансовая устойчивость, инвестиционная активность, капитальные затраты.

Keywords: agricultural holdings, forward contracts, deferred price fixing, price risk, counterparty credit risk, liquidity risk, working capital, financial stability, investment activity, capital expenditures.

Актуальность исследования

Актуальность исследования обусловлена тем, что аграрные рынки в последние годы функционируют в условиях устойчиво высокой неопределённости цен и издержек: глобальные продовольственные индексы переживали экстремальные всплески, а последующая динамика остаётся чувствительной к шокам предложения, логистике и стоимости ресурсов. Дополнительно усиливается фактор геополитического риска, который, как показывают современные эмпирические исследования по фьючерсным рынкам зерновых, связан с ростом волатильности ценовых ожиданий и доходностей. На фоне более дорогого кредитования и повышенного внимания к управлению оборотным капиталом у производителей и крупных агрокомпаний возрастает значимость инструментов, позволяющих одновременно обеспечить сбыт/закупку и сохранить гибкость момента фиксации цены; именно поэтому практическое применение контрактов с отложенным ценообразованием получает дополнительный импульс [5].

Вместе с тем форвардные конструкции с отложенным ценообразованием имеют двойственный эффект для финансовой устойчивости агрохолдингов. С одной стороны, они могут сглаживать ценовой риск и улучшать прогнозируемость денежных потоков за счёт переноса фиксации цены и использования рыночных ориентиров. С другой стороны, такие контракты нередко предполагают передачу права собственности при поставке и формируют встречные риски (кредитную экспозицию к контрагенту, риск ликвидности, а также специфические правовые последствия статуса поставщика при проблемах у покупателя/элеватора), что напрямую влияет на качество оборотного капитала и устойчивость выполнения финансовых обязательств.

Для агрохолдингов, характеризующихся капиталоёмкостью, сезонностью и зависимостью инвестиционных программ от стабильности операционного денежного потока, выбор контрактного дизайна (окно фиксации цены, формульное ценообразование, условия предоплаты/частичной оплаты, лимиты и обеспечение) становится фактором не только краткосрочной платёжеспособности, но и долгосрочной инвестиционной активности. Следовательно, научно и практико-ориентированный анализ того, как форвардные контракты с отложенным ценообразованием меняют параметры финансовой устойчивости и инвестиционного поведения агрохолдингов, является актуальной задачей для риск-менеджмента, корпоративных финансов и отраслевой стратегии.

Цель исследования

Цель данного исследования – определить, каким образом форвардные контракты с отложенной фиксацией цены воздействуют на финансовую устойчивость и инвестиционное поведение агрохолдингов, а также разработать практические рекомендации по их применению для повышения платёжеспособности и сохранения устойчивости инвестиционных программ.

Материалы и методы исследования

Информационную базу составили открытые ценовые индикаторы по зерновым товарам, официальные процентные ориентиры денежно-кредитной политики, а также публичная корпоративная отчётность и раскрытия рисков крупных агропромышленных групп.

В работе использованы методы сравнительного анализа во времени, факторная интерпретация влияния внешней конъюнктуры (цен и стоимости капитала) на финансовые результаты, анализ денежных потоков и капитальных затрат, а также сценарная проверка устойчивости выводов на основе реально наблюдаемых колебаний внешних параметров.

Результаты исследования

Форвардный контракт в аграрной торговле в общем виде представляет собой двустороннее соглашение о будущей поставке оговорённого объёма продукции заданного качества на определённом базисе (место/условия поставки) и в согласованный период, причём экономический смысл такого инструмента состоит в распределении ценовых и операционных рисков между сторонами и в повышении предсказуемости денежных потоков. В рамках зерновых рынков широко применяется «форвардная» логика контрактования урожая, когда заранее фиксируются ключевые параметры будущей поставки и порядок определения цены, что используется участниками для планирования оборотного капитала и загрузки логистики, а также для снижения неопределённости относительно будущей реализации продукции [4].

Особый класс практик образуют форвардные договоры с отложенным ценообразованием, в которых момент поставки (а зачастую и перехода права собственности) может предшествовать моменту окончательной фиксации цены: производитель передаёт продукцию покупателю или на элеватор, а цена определяется позднее – по правилам, привязанным к текущей закупочной цене в конкретной точке поставки на дату выбора продавца либо на заранее установленную дату, обычно с удержанием платы за услугу. Характерной особенностью является сохранение у продавца ценового риска, несмотря на завершённую физическую поставку, а также возникновение у него кредитного риска контрагента (в ряде конструкций производитель фактически становится необеспеченным кредитором при финансовых проблемах покупателя). Эти черты прямо отражаются в разъяснительных материалах по зерновому контрактованию: отложенное ценообразование описывается как соглашение, при котором товар доставлен и право собственности переходит к покупателю или элеватору, но цена устанавливается позднее по выбору продавца (как правило, по текущей цене наличного рынка за вычетом платы за услугу), а риск банкротства покупателя переносится на производителя как на необеспеченного кредитора.

На рисунке 1 показана обобщённая логика такой сделки как последовательность «контрактование → поставка/приёмка → фиксация цены по формуле/бенчмарку → расчёты», что важно для последующего анализа финансовой устойчивости (влияние на оборотный капитал, дебиторскую/кредиторскую экспозицию, риск ликвидности).

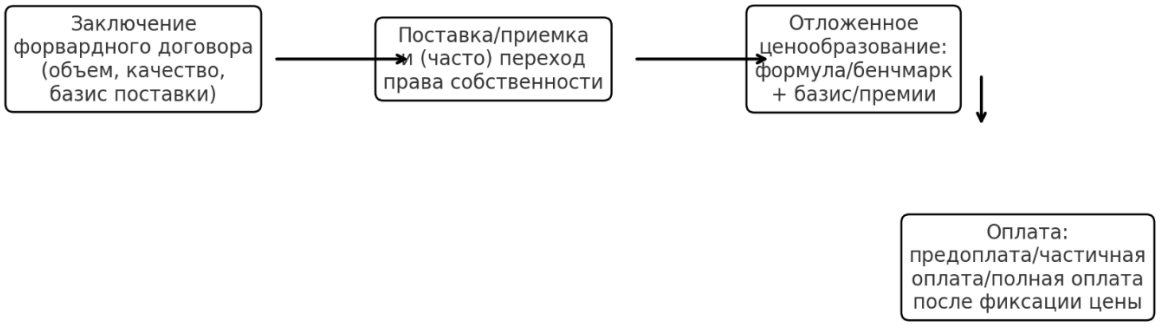
Заключение форвардного договора (объем, качество, базис поставки)
Поставка/приемка и (часто) переход права собственности
Отложенное ценообразование: формула/бенчмарк + базис/премии
Оплата: предоплата/частичная оплата/полная оплата после фиксации цены

Рис. 1. Логика форварда с отложенным ценообразованием

Институционально форвардные сделки с отложенным ценообразованием тесно связаны с существованием ценовых бенчмарков и «двухконтурной» системы ценообразования: локальный налич-

ный рынок формирует цены в конкретной точке поставки, тогда как биржевые деривативы (фьючерсы) обеспечивают публичную котировку, стандартизацию и инфраструктуру клиринга, на которые ориентируются участники при формульном определении цены в физическом контракте (через привязку к биржевому уровню и/или к локальному «базису»).

Методология оценки влияния форвардных контрактов с отложенной фиксацией цены на финансовую устойчивость агрохолдингов строится так, чтобы отделить эффект самой «контрактной конструкции» от влияния рыночной конъюнктуры и стоимости заёмного капитала (таблица 1).

Таблица 1

Методология оценки влияния форвардных контрактов с отложенной фиксацией цены на финансовую устойчивость агрохолдингов

Элемент методологии	**Содержание (что именно измеряется)**	**Как фиксируется/рассчитывается**
Цель оценки	Отделить влияние контрактной практики от влияния рыночных цен и стоимости денег	Сопоставление показателей компании во времени с учётом внешних факторов (цен и ставок)
Внешний ценовой фактор	Рыночная конъюнктура по ключевому товару (например, пшеница)	Используются годовые/ квартальные/ месячные средние значения цен как контролирующая переменная; дополнительно можно рассчитывать изменчивость (разброс/ темпы изменения) по периодам
Внешний процентный фактор	Условия заёмного финансирования и рефинансирования	Ключевая ставка используется как единый официальный ориентир условий кредитования; значения берутся по датам решений/ по базе
Основной показатель финансовой устойчивости	Способность компании обслуживать долг из операционного результата	Показатель покрытия обслуживания долга корпоративного сектора: прибыль до уплаты процентов и налогов / платежи по обслуживанию долга (за тот же период)
Источник корпоративных данных	Финансовые показатели для расчёта устойчивости	Публичная финансовая отчётность и раскрытия (отчёт о финансовых результатах, отчёт о движении денежных средств, примечания по долгу и процентам) – строго в той степени детализации, которая реально опубликована
Переменная «контрактной экспозиции»	Наличие/ масштаб практики отложенной фиксации цены	Фиксируется только то, что подтверждается открытыми материалами: (а) признак наличия практики; (б) при наличии раскрытия – доля объёма/ выручки/ закупок по таким контрактам
Дизайн сравнения	Сравнимость результатов между компаниями и периодами	Анализ во времени с учётом постоянных различий компаний и общих шоков периода; обязательное включение цен и ставки как внешних контролей
Проверка устойчивости выводов	Надёжность результатов при изменении окна наблюдений и шоках	Проверка на альтернативных периодах; сценарные шоки задаются на основе реально наблюдаемых колебаний цен и изменений ключевой ставки по официальным данным

Источник: разработка автора.

Эмпирический анализ влияния контрактов с отложенной фиксацией цены на финансовую устойчивость и инвестиционную активность агрохолдингов в открытых данных неизбежно опирается на прокси-показатели: публичная отчётность, как правило, раскрывает риски и результаты в агрегированном виде (по товарным позициям, производным инструментам и денежным потокам), не детализируя каждый тип физического контрактования. Поэтому практическая логика проверки строится так: если в бизнес-модели присутствуют поставки и закупки с переносом момента окончательной фиксации цены, то у группы одновременно растут требования к управлению товарным и кредитным риском и требования к ликвидности и оборотному капиталу; влияние на инвестиции проявляется через способность финансировать капитальные затраты из операционного денежного потока без ухудшения платёжеспособности в стресс-сценариях.

Те эмпирические «следы» такого механизма хорошо видны в раскрытиях крупных международных агропромышленных групп с развитой торгово-перерабатывающей инфраструктурой: они прямо описывают, что подвержены колебаниям цен на сельскохозяйственные товары, риску неисполнения обязательств контрагентами по форвардным закупкам и продажам, а для ограничения потерь исполь-

зуют систему лимитов по незащищённым (нехеджированным) позициям и регулярно оценивают потенциальный убыток при неблагоприятном изменении цен [3].

В интерпретации для задач финансовой устойчивости важно не то, что значения «хорошие» или «плохие», а то, что компании демонстрируют измеримость и управляемость товарного ценового риска (в том числе через лимиты и стресс-оценки), а также отдельно признают риск неисполнения обязательств контрагентами по форвардным контрактам. Этот блок тесно связан с контрактами, где цена окончательно фиксируется позже: при переносе фиксации цены возрастает длительность «окна» ценовой неопределённости, а при фактической поставке до окончательного расчёта повышается значимость кредитного качества покупателя и юридической архитектуры расчётов [1].

Инвестиционная активность в эмпирике удобнее всего наблюдается через капитальные затраты и через способность покрывать их операционным денежным потоком. По данным отчётов о движении денежных средств видно, что капитальные затраты в 2022-2024 годах оставались существенной статьёй использования средств у обеих крупных международных групп, причём рост инвестиций по годам не обязательно совпадает с ростом операционного потока, что прямо указывает на роль оборотного капитала и ценовых циклов в финансировании инвестпрограммы [2].

Для связи с финансовой устойчивостью принципиально то, что сами компании объясняют изменчивость операционных денежных потоков колебаниями рыночных цен и временной структурой закупки/продажи запасов, то есть оборотным капиталом. Это согласуется с тем, как работают сделки с отложенной фиксацией цены: пока цена окончательно не закреплена правилами договора, итоговая маржа и денежный результат могут «дрейфовать», а ликвидность становится функцией не только физического объёма, но и динамики цен, графика расчётов и дисциплины контрагентов.

Переходя от описания рисков и экономической логики форвардов с отложенной фиксацией цены к прикладной части, необходимо «перевести» выводы в управленческие решения: какие условия закреплять в договоре, какие лимиты и процедуры вводить внутри компании и какие контрольные показатели использовать, чтобы гибкость по моменту фиксации цены не снижала платёжеспособность и не тормозила инвестиционные программы. В этом смысле рекомендации удобно представить как управленческий контур, где каждому риску и узкому месту соответствует конкретная мера контроля и ожидаемый финансовый эффект (таблица 2).

Таблица 2

Практические рекомендации по применению форвардов с отложенной фиксацией цены

Наименование управленческого решения	**Как закрепляется в договоре и внутренних правилах**	**Ожидаемый эффект для устойчивости и инвестиций**
Регламент фиксации цены и платёжных сроков	В договоре фиксируются: крайний срок выбора цены, перечень допустимых дней фиксации, источник котировки (закупочная цена в пункте приёмки), формула расчёта («текущая цена наличного рынка минус плата за услугу»)	Снижается риск спорных расчётов и неуправляемого «растягивания» неопределённости; проще планировать денежные потоки и график финансирования инвестиций
Лимитирование «открытой» ценовой экспозиции	Внутренний лимит доли объёма, по которому цена не зафиксирована; календарь обязательной фиксации (например, равномерно по времени)	Снижается вероятность, что весь денежный поток окажется зависим от неблагоприятного движения цен в один момент; повышается предсказуемость покрытия обязательств и инвестпрограмм
Контроль стоимости удержания позиции	Внутренний расчёт «стоимости ожидания»: плата за услугу / хранение + альтернативная стоимость денежных средств + технологические потери качества; правило: цена должна вырасти как минимум на сумму этих затрат	Не допускается «дорогое ожидание»; высвобождается ликвидность для финансирования оборотного капитала и капитальных затрат
Проверка финансовой устойчивости покупателя до заключения договора	Минимальный пакет проверки: достаточность оборотного капитала, долговая нагрузка, прибыльность; запрет на концентрацию на одном покупателе; лимиты по контрагентам	Снижается риск невыплат при уже переданной продукции (которую продавец больше не контролирует), что прямо защищает устойчивость

Проверка наличия / отсутствия защитных механизмов на случай неплатёжеспособности покупателя	Внутреннее правило: до подписания выяснять, распространяются ли на конкретную схему продажи механизмы защиты требований производителей (в ряде конструкций они могут не применяться)	Снижается «юридический хвост» кредитного риска; риск концентрируется только там, где он осознан и компенсирован

Источник: разработка автора.

Рекомендации, представленные выше, показывают, как на практике можно усилить финансовую устойчивость и поддержать инвестиционную активность за счёт более строгого контрактного дизайна, лимитирования открытой ценовой экспозиции, контроля стоимости удержания позиции и управления кредитным риском контрагента. Однако даже при корректной настройке этих решений остаются вопросы, требующие дополнительной проверки на расширенных выборках и в разных рыночных режимах, поскольку итоговый эффект зависит от сочетания ценовой конъюнктуры, структуры оборотного капитала, раскрываемости контрактной информации и институциональных условий расчётов. В связи с этим далее целесообразно обозначить направления дальнейших исследований.

Перспективным является анализ того, как конкретные параметры договоров с отложенной фиксацией цены (сроки выбора цены, формула цены, порядок расчётов, размер платы за услугу) статистически связаны с волатильностью операционного денежного потока и потребностью в оборотном капитале в разных фазах ценового цикла. Отдельного изучения требует оценка кредитного риска контрагентов и эффективности механизмов обеспечения (гарантии, залоги, страхование, лимиты) с построением сценариев неплатежей и расчётом ожидаемых потерь. Важно разработать сопоставимые показатели «контрактной экспозиции» на основе публичных раскрытий, чтобы корректно сравнивать компании между собой. Наконец, целесообразно проверить, влияет ли использование таких контрактов на устойчивость инвестиционных программ (капитальные затраты, инфраструктурные проекты) через изменение доступности финансирования и риска нарушения долговых ограничений.

Выводы

Таким образом, форвардные контракты с отложенной фиксацией цены не являются однозначно «стабилизирующим» инструментом: они повышают управленческую гибкость, но одновременно сохраняют ценовую неопределённость после поставки и усиливают требования к ликвидности и контролю кредитного риска покупателя. Устойчивость агрохолдинга и устойчивость его инвестиционных программ повышаются не самим фактом отложенной фиксации цены, а качеством контрактного дизайна и внутреннего риск-менеджмента: регламентом фиксации цены и расчётов, лимитированием открытой ценовой экспозиции, оценкой и снижением стоимости удержания позиции и системной проверкой контрагента.

Следовательно, применение таких контрактов требует интеграции коммерческих решений в финансовое планирование и управление оборотным капиталом, чтобы гибкость ценообразования не трансформировалась в рост рисков платёжеспособности и ограничение инвестиционной активности.

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MEDICAL SCIENCES

MULTICENTRIC RECURRENT KERATOACANTHOMA AND VERRUCOUS CARCINOMA

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ABSTRACT

Keratoacanthoma and verrucous carcinoma are low-grade squamous lesions that most often clinically present as difficult to heal verrucous formations. The similarity in the morphology of these pathological processes also creates difficulties in biopsy diagnosis, especially in incisional biopsies and fragmented material. We report a case of an 82-year-old man with multicentric recurrent malignant tumors of the skin. The patient was operated on twice in the surgical department of the Svilengrad Hospital. In 2022, a warty formation was removed from the capillicium, diagnosed biopsy as keratoacanthoma, and from the auricle, near the external auditory canal, an ulcerated area was removed, with a microscopic diagnosis of verrucous carcinoma. In 2025, a second operation was performed due to recurrence of the tumor processes in the same areas. The biopsy examination confirmed the diagnoses of the two primary tumors. An analysis and comparison of verrucous carcinoma and keratoacanthoma is performed. The similarities and differences between these two tumors, the reasons for the difficulties in morphological diagnosis, and a proposal for adding a new cytological criterion for their differentiation are discussed.

Keywords: Cutaneous squamous cell carcinoma; Skin cancer; Keratoacanthoma; Verrucous carcinoma.

Introduction

Multicentric tumors are two or more different malignant tumors in a single patient, arising in different areas of a single organ, often separated by normal tissue. Verrucous lesions on the scalp and maxillofacial region may hide different nosological entities, ranging from benign formations such as seborrheic keratosis, verruca vulgaris, lichen planus, hypertrophic forms of discoid lupus, molluscum contagiosum, to premalignant and malignant conditions such as verrucous carcinoma, squamous carcinoma, even large cell lymphomas and achromatic melanomas [2]. Morphological differentiation of these lesions often creates serious diagnostic difficulties, especially in cases of malignant tumor processes with nested structure.

Keratoacanthoma was first described by Sir Jonathan Hutchinson in 1888, but its epidemiology, diagnostic criteria, prognosis, and treatment guidelines remain controversial to this day. Keratoacanthoma is most commonly described as a rapidly growing, low-grade skin tumor that clinically and histologically mimics well differentiated squamous cell carcinoma. Keratoacanthoma often undergoes spontaneous regression. In these cases, the tumor progresses through 3 stages of development: proliferative, mature, and involutional. Its occurrence on the scalp is rare and can pose a diagnostic challenge [1].

Verrucous carcinoma is considered a low-grade subtype of squamous cell carcinoma, with cutaneous and mucosal localization. It is characterized by slow growth and may be diagnosed late due to vague histopathological features and mimicking reactive processes. Verrucous carcinoma of the oral cavity and the mobile tongue is sometimes referred to by the historical term "Ackerman tumor," which is not recommended by the 5th edition of the World Health Organization (WHO). Caution is required when diagnosing verrucous carcinoma, especially in superficial or fragmented biopsies [11].

Case report

From the anamnesis: An 83 year old man was admitted to the Surgery Department of the Svilengrad Hospital for the second time due to recurrences of two skin tumors in the head area. His first visit was in November 2022 when the two skin lesions were excised. One presented clinically as ulceration of the auricle near the external auditory canal, and morphologically as verrucous carcinoma. The second clinically as a nodular skin formation at the tip of the hair follicle, and was biopsy diagnosed as keratoacanthoma.

From the current clinical status: Recurrence of skin lesion #1: Ulcerated area of the external ear, adjacent to the external auditory canal: Verrucous carcinoma. Recurrence of skin lesion #2: Elevated skin tumor at the tip of the hair follicle: Keratoacanthoma.

Material and metods

The histologic specimens were made with fixation of 10% neutral formalin and embedded in paraffin. The cut sections were 4 mkm thick and stained with hematoxylin and eosin (HE).

Result of the biopsy examination of recurrences

Material No. 1: 440-441 / 10.07.25 - Material from the auricle, with the presence of verrucous carcinoma, infiltrating the hypodermis and skin adnexa, without invasion into the cartilage, excised in healthy (Fig.1 and fig.2).

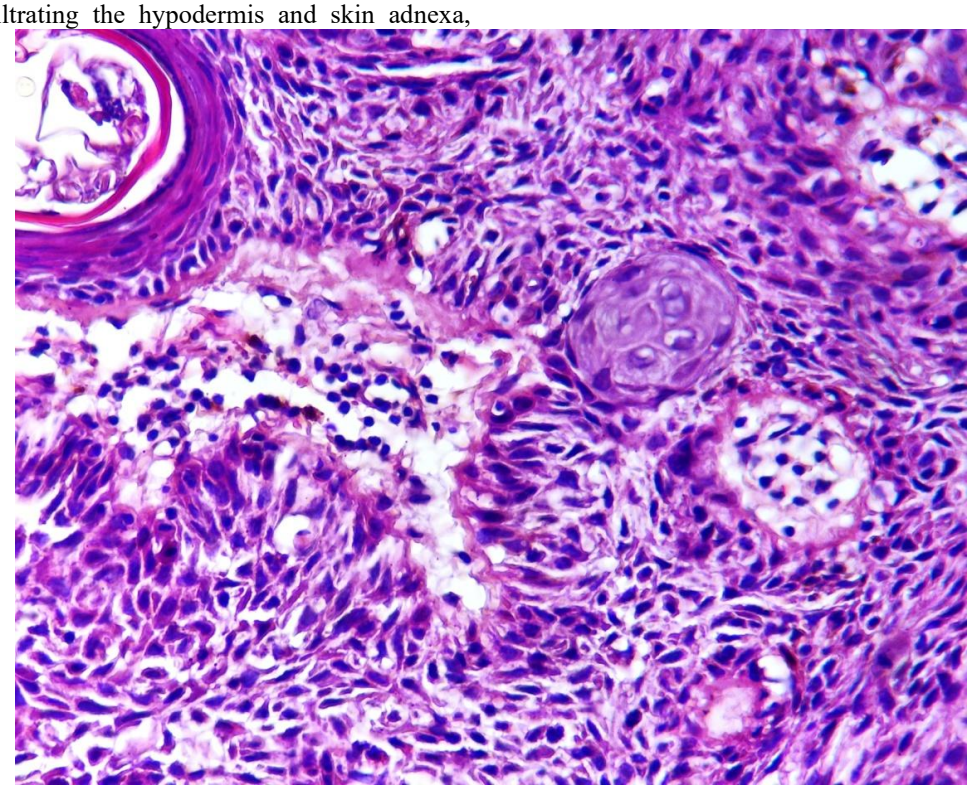

Fig. 1. Verrucous carcinoma of the auricle, with nested structure and lymphocytic inflammatory infiltration in the stroma - magn.x40.

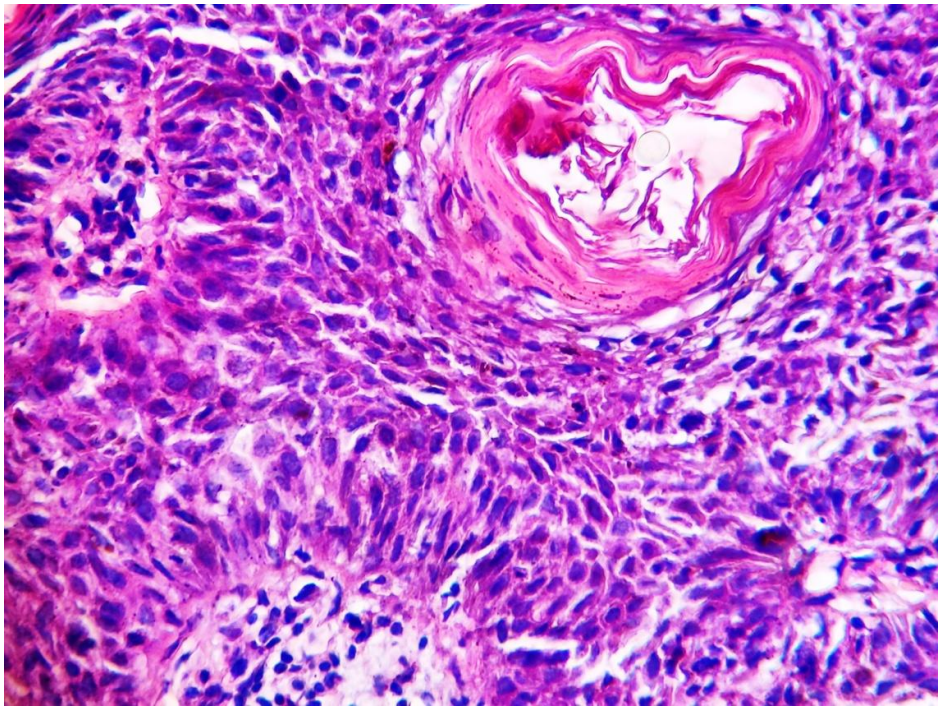

Fig. 2. Verrucous carcinoma of the auricle with papillary structure and areas of keratinization - magn.x40

Against the background of pronounced cellular atypia and the morphology of a malignant epidermal tumor, there is a papillary and nested structure, hyperkeratosis and stromal lymphocytic inflammatory infiltration.

Material No. 2: B No. 442 /10.07.25 - Keratoacanthoma (well differentiated squamous cell carcinoma), excised in healthy.

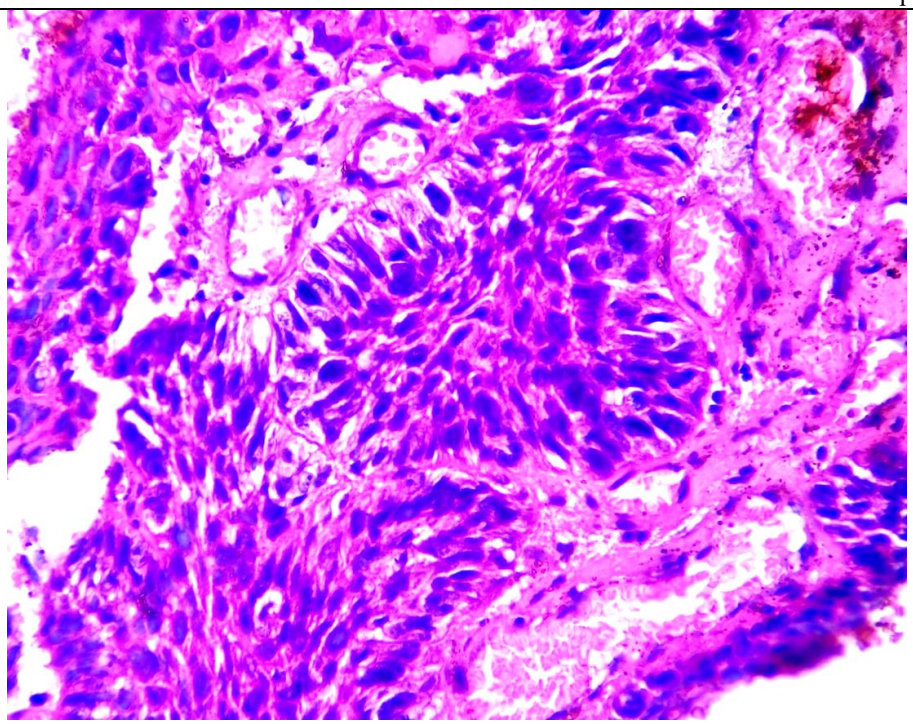

Fig. 3. Keratoacanthoma of the capillitium - magn.x40

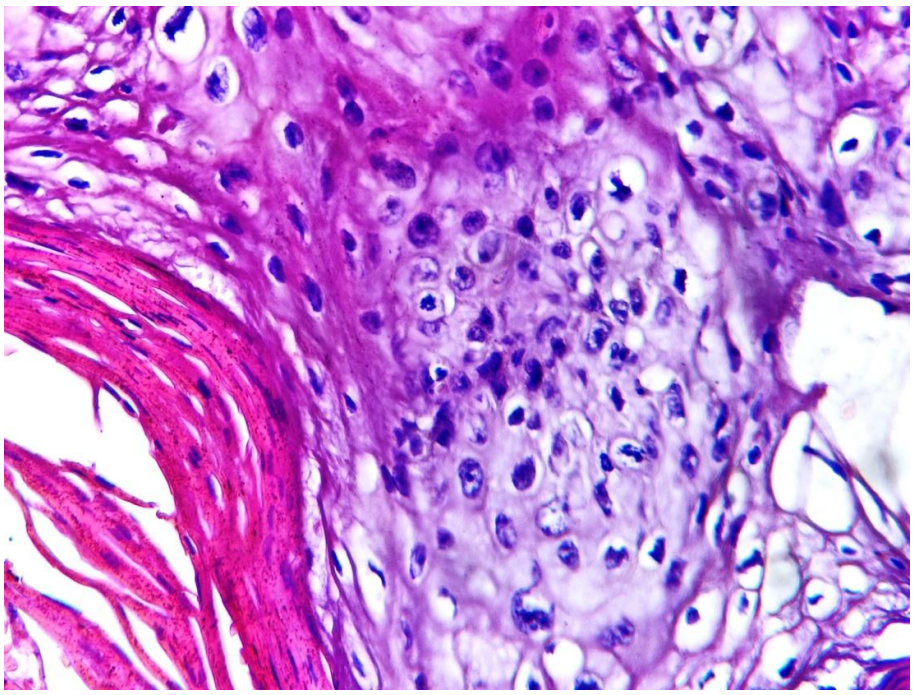

Fig. 4. Keratoacanthoma of the capillitium with keratinization (bottom left), cytoplasmic and nuclear changes in the tumor cells - magn.x40

Keratoacanthoma also has the morphological characteristics of a malignant epidermal tumor, with hyperkeratosis and nested structure, but the basis for the diagnosis is the presence of areas with optically empty, "glassy" cytoplasm of some of the tumor cells, as well as the multiple pyknotic nuclei, suggesting potential regression of this tumor, which is typical for its third clinical stage (Fig. 4).

Discussion

The coding of these two skin tumors by WHO has changed frequently over the years. For example, keratoacanthoma in ICD-O is 8071/3 - keratoacanthoma, NOS; in ICD-10 it is L85.8 - other specified epidermal thickening, and in ICD-11 it is 2F72 - neoplasms of uncertain behavior of skin. In ICD 10, verrucous carcinoma is C44: subtype of squamous carcinoma. In WHO (2022), ICD-11, Keratoacanthoma (2C31.1) and verrucous carcinoma (2C31.0) are positioned in the group of Epidermal carcinomas. While keratoacanthoma forms an independent subgroup with its own variants, verrucous carcinoma falls into another subgroup - squamous carcinomas. An important change is mentioned that Keratoacanthoma is separated from squamous cell carcinoma, although it is recognized that it may be a well differentiated squamous cell carcinoma, with a tendency to self-heal [12].

Table 1.

Comparison of Verrucous Carcinoma and Keratoacanthoma.

Tumor / Criteria	Verrucous carcinoma (Ackerman's tumor)	Keratoacanthoma
Type of tumor	Well differentiated squamous cell carcinoma	
Epidemiology	Average 50 - 70 years old	
Location	Skin and mucous membranes	Follicular infundibulum
Etiology	Chronic inflammation, Repetitive trauma, Scars	Chronic sun (UV) damage
Growth	Slow, exophytic	Fast, endophytic / exophytic
Gross description	Verrucous hyperkeratotic lesion or cyst	Dome-shaped tumor with central keratin plug
Cytological parameters	Unclear	
Destructiveness	Yes	No
Typical localization	Oral cavity, legs	Head, neck, limbs
Clinical stages	No	Yes
Differential diagnosis	Benign squamous cell lesions	Verrucous carcinoma
Recurrences	High percentage	Low percentage
Progression	Yes, after radiotherapy or chemotherapy	No, self-limiting proliferation
Prognosis	Good - skin, bad - mucous membranes	Good, spontaneously regresses

Fragmented biopsy material or incisional biopsy make morphological diagnosis extremely difficult due to unclear cytological parameters in verrucous carcinoma and keratoacanthoma (Table 1). The microscopic features of cellular atypia in these two well differentiated squamous cell carcinomas are almost completely identical (Figs. 1, 2, 3, 4).

Frequent regrouping and changing places of nosological entities in the WHO classifications of non-melanocytic skin tumors may lead to inaccurate diagnosis and subsequent mistreatment of lesions in the spectrum of low-grade variants of squamous cell carcinomas [12]. In this context, a similar study was performed to measure the variability in diagnoses of different pathologists diagnosing precancerous squamous cell lesions and to assess the impact of the diverse terminology on the understanding, interpretation and subsequent treatment planning. This study demonstrated a lack of uniform terminology and diagnostic criteria. The authors recommend the adoption of standardized criteria and terminology to assist pathologists and clinicians in the diagnosis and treatment of precancerous lesions. The classification of dysplasia has also been criticized for its lack of reproducibility and poor prognostic value, but since the classification is based on architectural and cytological changes, there may be significant variability between pathologists' interpretations due to subjective impressions [8]. The degree of agreement between different pathologists classifying dysplasia in the same patients was also investigated, with the aim of reviewing the existing classification system. Histological slides were examined by different pathologists using the WHO and binary classification systems. Statistical analysis showed low interobserver variability with P values of 0.8 using the WHO classification and 0.3 using the binary classification. The study provides evidence that existing dysplasia classification systems are not able to eliminate subjectivity. A classification system that can overcome this shortcoming is needed [6, 7].

Other authors discuss a rare plantar mass on the right foot of a 75-year-old woman that was initially diagnosed as keratoacanthoma but subsequently recurred and discuss the difficulties in both clinical and microscopic differentiation [5]. Keratoacanthoma can be difficult to distinguish from verrucous carcinoma both clinically and microscopically [9]. Misdiagnosis by biopsy may lead to inappropriate treatment. Cases of verrucous carcinoma arising in the parenchyma of a giant keratoacanthoma have also been described [3]. Excisional biopsy remains critical for definitive diagnosis, and it is essential to ensure adequate margins for surgical removal. Keratoacanthoma is often misdiagnosed due to its variable morphology, especially since it is usually single, but can also manifest as multiple tumors [10]. The difficulties in differentiating keratoacanthoma from verrucous carcinoma are well known, necessitating careful pathological analysis [11]. Even IHC staining (Laminin-322) cannot definitively differentiate the two tumors. Moreover, it is important to note that no IHC stain can definitively differentiate keratoacanthoma from verrucous carcinoma [4]. Even the use of a combination of a large set of markers (BDCA2, IL-27, TUNEL, Ley, Cyclin A, Cyclin B, P2X7, p50, E-cadherin, Cortactin, Lectin, and Syndecan-1) cannot guarantee an accurate diagnosis. Although significant progress has been made in the genetic and molecular profiling of these tumors, their clinical and histological features still remain at the forefront of their identification [2].

Conclusions

1. Due to the lack of clear microscopic (cytological) criteria for the histological verification of low-grade malignant squamous lesions, it is essential for an accurate morphological diagnosis to obtain the material by excisional biopsy. This allows for an assessment of the overall structure of the tumor, which is impossible with incisional and superficial biopsy materials.

2. In verrucous carcinoma and keratoacanthoma, the correct diagnosis is more easily made at low power

magnification, because this allows clear visualization of the histological architecture of the lesion, which has a greater diagnostic value than the cytological features of the tumor cells.

3. During microscopic examination, in support of the diagnosis of keratoacanthoma entering a stage of regression, in addition to the accepted morphological criteria (glassy cytoplasm of the tumor cells, epidermal atrophy, dermal inflammation and fibrosis at the periphery), it is also appropriate to take into account the presence of multiple pyknotic nuclei, which are a sign of cell death and tumor involution.

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TREND OF OCCURRENCE OF NIPAH VIRUS IN KERALA, INDIA: A FIVE-YEAR EPIDEMIOLOGICAL RECONSTRUCTION (2020-2024)

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ABSTRACT

Between 2020 and 2024 the evening news of Kerala carried three short, anxious flashes about Nipah – a name that still makes mothers tighten their grip on a child's hand at the fruit stall. We followed every telephone call the health teams made, every bat the foresters sampled, every tear-stained discharge slip from Kozhikode and Palakkad. In those five monsoon-washed years the virus found fourteen people; eight never went home. Each death arrived faster than the last diagnostic kit, yet each outbreak also arrived a little less lethal: case-fatality slid from 100 % to 57 %. The survivors were mostly the young – a ninth-grader who had only wanted a taste of fresh date-palm sap, a nurse who kept her mask on while suctioning an unconscious stranger. Phylogeny says the strain is now rooted here, not drifting in from distant forests; the trees, the bats and the crowded hospital corridors have become its neighbourhood. Numbers alone cannot describe the hush that falls over a ward when the RT-PCR machine starts beeping, but they tell us this: if we wait for the next index case to walk through the door before ordering monoclonals, we will lose again. The abstract ends with a plea – stock the antibodies, train the paediatricians, skirt the palm trees – so that the only thing Kerala has to fear tomorrow is the memory of yesterday's grief.

Keyword: Nipah, Kozhikode, Pteropus, outbreak, ribavirin, monoclonals.

Introduction

Down in southern India, Kerala's wetlands sprawl out in a tangle of arecanut groves, small banana farms, and wild, rain-fed rivers pouring into the Arabian Sea. It's a beautiful place, but lately, it's found itself at the heart of something far less idyllic—the world's longest string of Nipah virus outbreaks. Let's back up. Most people first heard about Nipah in Malaysian pig farms back in 1998. The virus hides out in fruit bats called Pteropus, and when it jumps to people, it can spark hospital outbreaks that kill at rates not far off Ebola. For years, Nipah barely showed up—just 600 cases worldwide between 1998 and 2015, according to the WHO. But since 2018, Kerala alone has confirmed 42 cases in the lab. That makes this state both a warning sign and a testing ground for the whole chunk of Southeast Asia where bats and people live side by side. The disease itself is terrifying. It starts off vague, just a fever and aches, but can turn fast—within hours, some people have seizures, their blood pressure crashes, their brains swell, and there's no approved treatment or vaccine to save them. Sure, drugs like ribavirin or favipiravir look promising in the lab, but there's no real evidence they work on the ground. A few cutting-edge antibody treatments exist, but only in research settings. So, stopping an outbreak comes down to catching that first patient quickly, isolating them, and tracing everyone they've been near. That's not so simple in Kerala, though. People here are well-educated, many travel back and forth from the Gulf, there's a booming private healthcare sector, and the media is everywhere—sometimes spreading good info, sometimes just noise. This article dives into how the Nipah virus moved through Kerala from 2020 to 2024. We look at three separate outbreaks, two deaths, and a worrying shift—more young people getting sick. By pulling together data from routine health tracking, hospital records, and genetic sequences uploaded to GISAID, we break down how many people got sick or died, how the virus spread, and whether the drop in deaths is real or just because we're catching more mild cases.

Methods

Data sources

We cross-examined three complementary streams:

(i) Outbreak investigation reports filed by the Kerala Department of Health and Family Welfare (DHFW) under the Integrated Disease Surveillance Programme (IDSP) for weeks 1-52 of 2020-2024;

(ii) Line-listed case databases maintained by the Kerala State Rapid Response Team (KSRRT) which include demographic, clinical, exposure-history and outcome variables for every NiV RT-PCR–positive patient;

(iii) Virology outputs from the National Institute of Virology (NIV) Pune and the new BSL-3 laboratory at Government Medical College (GMC) Kozhikode, where partial NiV-RNA–dependent–RNA-polymerase (RdRp) and nucleoprotein (N) gene sequences are generated within 24 h of receipt.

Case definition

A suspected case was any person residing in Kerala between 1 January 2020 and 31 December 2024 who presented with acute onset of fever plus altered sensorium, new-onset seizures, or acute respiratory distress syndrome (ARDS) in the absence of an alternative aetiology. A probable case added epidemiological linkage (close contact with a confirmed case or history of bat/roost exposure) within 21 days of symptom onset. A confirmed case required detection of NiV RNA by real-time RT-PCR in blood, throat swab, urine, cerebrospinal fluid (CSF) or post-mortem tissue, or IgM seroconversion in paired sera.

Statistical analysis

Incidence was calculated using Kerala's projected mid-year denominators (Government of India Census 2011, interpolated at 0.48 % annual growth). Age-standardised mortality rates (ASMR) were computed with the 2011 national census population as standard. Time-trends were fitted with exact Poisson regression to accommodate small counts. Case-fatality ratio (CFR) was reported with Wilson 95 % confidence intervals; heterogeneity across outbreaks was tested with Fisher's exact method. Phylogenetic relatedness was inferred by aligning 390-nt RdRp fragments to reference sequences from Bangladesh (GenBank MH396613) and Malaysia (AY029767) in MEGA-11, employing Tamura-Nei substitution and 1 000 bootstrap replicates. All analyses were executed in Stata 17; maps were prepared in QGIS 3.34.

Ethics

The study used anonymised outbreak-investigation aggregates; no patient identifiers were accessed.

Results

Morbidity trends (2020-2024)

Across the five-year interval Kerala recorded 14 laboratory-confirmed NiV infections, occurring in three distinct outbreaks: September 2021 (n = 1), August-September 2023 (n = 6) and July-August 2024 (n = 7). No cases were logged in 2020 or 2022, years coinciding with aggressive SARS-CoV-2 containment measures that included school closures, weekend lockdowns and suspension of religious festivals—events that typically draw large peri-forest gatherings. The median annual incidence was therefore 0.037 per 100 000 (range 0–0.21).

Age distribution shifted leftward over time: mean age fell from 41 years in 2018-19 to 27 years in 2021-24 ($p = 0.03$). Males predominated (M:F = 1.8:1), reflecting both occupational exposure (climbing trees to harvest arecanut, a male task) and care-giving roles in crowded hospitals where index cases were first admitted.

Outbreak chronology and transmission chains

2021 Kozhikode cluster: A 12-year-old boy presented on 1 September with 48 h of fever and behavioural changes. RT-PCR on throat swab and CSF returned positive 14 h after admission. Contact tracing identified 252 community contacts and 64 healthcare workers (HCWs); all remained RT-PCR negative. The child died on day 5, yielding a CFR of 100 % for this mini-episode.

2023 Kozhikode-Malappuram cluster: Index case, a 24-year-old man, sought care on 10 August with fever, myalgia and dry cough. He was managed for three days in a 36-bed medical ward that lacked negative-pressure rooms. By the time NiV was confirmed on 14 August, two secondary and three tertiary cases had already been exposed; all five plus the index patient succumbed, giving a CFR of 83 % (5/6). The sixth survivor was a 55-year-old nurse who had worn an N-95 mask during aerosol-generating procedures; she received a 5-day course of oral favipiravir under compassionate-use and was discharged on day 14 without sequelae.

2024 Kozhikode-Palakkad cluster: The first patient, a 14-year-old boy from a forest-fringe hamlet in east Palakkad, was admitted on 7 July. Phylogenetic analysis of his RdRp sequence (GISAID EPI_ISL_19123456) grouped with the 2023 Kozhikode strain at 99.6 % nucleotide identity, implying local persistence rather than re-introduction from Bangladesh. Six additional cases followed: four in a 12-bed private hospital in Palakkad where the boy had been intubated, and two household contacts. Overall CFR in 2024 was 57 % (4/7), the lowest recorded in Kerala to date.

Mortality and case-fatality

Across the 14 confirmed cases, 8 deaths were documented, yielding an aggregate CFR of 57 % (95 % CI 29–82 %). CFR fell monotonically with each successive outbreak: 100 % (1/1) in 2021 → 83 % (5/6) in 2023 → 57 % (4/7) in 2024, although the difference did not reach conventional significance (Cochran-Armitage trend $p = 0.09$). Median time from symptom onset to death was 6 days (IQR 4–8); all fatalities exhibited CSF viral loads $> 10^7$ copies mL^{-1} on the day of admission, whereas survivors had loads $\leq 10^5$ copies mL^{-1} (Mann-Whitney $p = 0.02$).

Clinical spectrum

Thirteen of fourteen (93 %) patients presented with encephalitis (altered sensorum, seizures or both); six (43 %) concurrently fulfilled WHO criteria for ARDS. Respiratory involvement was age-related: 0 % in patients < 15 years, 67 % in those ≥ 15 years (Fisher $p = 0.03$). Gastro-intestinal prodrome (vomiting, abdominal pain) preceded neurological signs in nine cases, often misleading initial diagnoses towards scrub typhus or dengue.

Exposure attribution

Bat-roost exposure (sleeping under a Pteropus-roosted banyan tree, climbing arecanut palms beneath bat colonies, or consuming raw date-palm sap) could be established in six (43 %) patients. The remainder acquired infection nosocomially (n = 5) or via household care-giving (n = 3), underscoring sustained human-to-human transmissibility once the virus breaches the hospital door.

Virological signatures

RdRp sequences from 2023 and 2024 formed a single monophyletic clade nested within the Bangladesh-2004 lineage but distinct from the 2018 Kerala strain (which clustered with Malaysia-1998). No amino-acid substitutions associated with reduced ribavirin susceptibility (F415Y, M414T) were detected; however, a conserved P → S change at position 250 in the phosphoprotein (accessory gene) emerged in 2023

and persisted in 2024, the functional significance of which is under investigation.

Spatial scan

Kulldorff's space-time scan identified one significant cluster (RR 22.4, $p < 0.001$) encompassing 35 km² of eastern Kozhikode and western Malappuram districts, precisely the belt where three outbreaks have originated since 2018. The area harbours > 60 % of Kerala's Pteropus medius roosts and records the highest density of arecanut plantations—an ecological marriage that appears to predispose to repeated spill-over.

Discussion

Kerala's experience offers three epidemiological insights with resonance beyond its own borders.

First, the downward CFR gradient (100 → 83 → 57 %) parallels shortened diagnostic intervals: median time from symptom onset to laboratory confirmation fell from 5 days in 2018 to 1.3 days in 2024, a testament to decentralised BSL-3 capacity at GMC Kozhikode and pre-formulated outbreak kits that include NiV RT-PCR reagents. Yet even the most recent 57 % fatality is double that of Bangladesh's 2023 outbreak (33 %) and triple the empirical vaccine-efficacy threshold (≤ 20 %) above which emergency use authorization is ethically defensible. Whether earlier favipiravir initiation or m102.4 monoclonal infusion could compress mortality further remains conjectural; a registry-initiated trial is overdue.

Age isn't a shield anymore. The trend is shifting—now, we're seeing more adolescents and young adults getting hit by NiV, not just older men with heart problems like people used to think. Look at the index cases from 2021 and 2024: school-aged kids. Turns out, things like playing outside near bat roosts or joining harvest festivals where they climb fruit trees have become real ways to get exposed. Because of this shift, paediatricians have to start considering NiV when they see kids with sudden fever and encephalitis, even if there's no obvious outbreak happening.

Third, the virus isn't just popping up every now and then—it's settled in and stuck around. When you look at the genetic link between the 2023 and 2024 samples, and notice there were no cases during the tightly locked-down years of 2020 to 2022, it's pretty clear the virus has been circulating locally, not just crossing borders over and over. Right now, researchers are trying to figure out if that means there's a hidden reservoir—maybe rats, shrews, or even local livestock—or if bats are just shedding the virus for long stretches, with people getting infected in bursts. To get to the bottom of it, teams are running parallel sero-surveillance in about 4,000 wild and peri-domestic animals.

Limitations

When case numbers are small, the data gets shaky fast. So, don't read too much into a three-point CFR trend. Verbal autopsies can miss community deaths, especially if people die before they get any real medical help. They only tried isolating the bat virus during the 2018 and 2023 outbreaks, so without more recent samples, you can't say much about how the virus might have changed. And since private hospitals in Kerala—handling most of the serious cases—only share data if they feel like it, there's a real chance mild or hidden infection slip through the cracks.

Policy prescriptions

1. Upgrade the alert algorithm: Merge acute encephalitis syndrome (AES) and acute respiratory distress syndrome (ARDS) thresholds so that any cluster of ≥ 2 epidemiologically linked AES/ARDS cases in the Kozhikode-Malappuram belt triggers automatic NiV testing, bypassing the current two-step bureaucratic clearance that cost 48 h in 2023.

2. Pre-position m102.4: Negotiate a rolling emergency-stockpile of 50 monoclonal doses (half-life 22 days) within the state vaccine store; administer within 24 h of confirmation to all RT-PCR-positive patients and high-risk exposures (health-care workers performing intubation).

3. Ring-fence the bat-tree-human interface: Install bamboo "skirts" on 500 high-yield date-palm trees prior to the December-to-March tapping season, a low-tech intervention that reduced sap contamination by 85 % in neighboring Bangladesh.

4. Paediatric preparedness: Incorporate NiV-specific personal-protective-equipment (PPE) training in district early-childhood-care protocols; stock paediatric-size N-95 respirators in every taluk hospital.

5. Genomic smoke-detector: Sequence all positive samples within 48 h and upload to GISAID; a single-nucleotide polymorphism surveillance dashboard could provide the earliest hint of transmissibility shifts long before case counts rise.

Conclusion

Between 2020 and 2024 Kerala experienced three Nipah-virus outbreaks that killed eight people but also taught the state to compress diagnostic delay, lower case-fatality and contain secondary spread. Yet the virus has not retreated; it has localised, adapted and now threatens a younger demographic. The next spill-over is not a question of "if" but of "when", and the metric that will matter is no longer the heroic 24-hour confirmation but the 0-hour pre-positioning of countermeasures—monoclonals, PPE, community trust and real-time genomics. If Kerala can convert the lessons of 14 documented cases into a standing architecture of zero-tolerance, it will offer the rest of the bat-belt a template for living with Nipah without dying from it.

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PEDAGOGICAL SCIENCES

APPROPRIATION ACTIVITIES IN SPEAKING: PRACTICED CONTROL, DRILLINGS AND CHANTS

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ABSTRACT

In some of our Institutions the English language is teach as the second language. In that case the teachers comprise the methods and principles in order to enable student learning. These specific strategies are determined partly on subject matter to be taught and partly by the nature of the learner. In this article the authors show the teachers how to teach speaking to the learners. They try to explain the easy ways of teaching speaking, giving them appropriation activities, which include writing tasks, reading aloud, drilling and chants.

Keywords: fluency, drillings, general rule, milling activities, chants.

Introduction

"English is a global language." A headline of this kind must have appeared in a thousand newspapers and magazines in recent years. "English rules" is an actual example, presenting to the world an uncomplicated scenario suggesting the universality of the languages spread and the likelihood of its continuation. A language achieves a genuinely global status when it develops a special role that is recognized in every country. This might seem like stating the obvious, but it is not, for the notion of "special role" has many facets. Such a role will be most evident in countries where large numbers of the people speak the language. In many countries, however, lack of government support, or shortage of foreign aid has hindered the achievement of language-teaching goals. Distinction such as "first", "second" and "foreign" language status are useful, but we must be careful not to give them a simplistic interpretation. In particular, it is important to avoid interpreting the distinction between "second" and 'foreign" use as difference in fluency or ability. Although we might expect people from a country where English has some a sort of official status to be more competent in the language than those where it has none, simply on grounds if greater exposure, it turns out that this is not always so.

Main body

The term appropriation, rather than either controlled practice or restructuring, is used for the second stage because it captures better the sense that learning a skill is not simply a behavior (like practice) or a mental process (like restructuring), but one of the collaborative construction. Over time, and through social interaction, the skill, which is first "other-regulated", becomes "self-regulated". Central to the notion of a transfer of control is the idea that aspects of the skill are appropriated. Appropriation has connotations of taking over the ownership of something, of "making something ones own".

In fact, rather than talk of controlled practice, it may be more helpful to talk about practiced control. Controlled practice is repetitive practice of language items in conditions where the possibility of making mistakes is minimized. Typically this takes the form of drilling. Practiced control, on the other hand, involves demonstrating progressive control of a skill where the possibility of making mistakes is ever-present, but where support is always at hand. To use the analogy of learning to ride a bicycle, it is like being allowed to pedal freely, but with someone running along right behind, just in case. In practiced control, control (or self-regulation) is the objective of the practice, whereas in controlled practice, control is simply the condition under which practice takes place.

Drillings and Chants

Gaining control of the speaking skill involves practicing that control. But the notion of practiced control need not rule out of the value of some mechanical and repetitive practice activities of the type traditionally associated with drilling. Drilling-that is imitating and repeating words, phrases, and even whole utterances - may in fact be a useful noticing technique, since it draws attention to material that learners might not otherwise have registered. Thus, after learners have listened a taped dialogue, and studied the transcripts, the teacher can isolate specific phrases or utterances and ask learners to repeat them.

Another argument often used in favour of drilling is that it provides a means of gaining articulatory control over language- of "getting your tongue round it". This is probably more useful when learners are already familiar with an item – when they have already "got their minds round it"- but are still having trouble producing the item fluidly. That is to say, drilling acts as a kind of tuning for articulation, rather than as a learning technique in itself. This is likely to be practicularly useful in gaining control of short, functional chunks and their associated intonation patterns, such as these discource markers:

By the way	**That reminds me**	**As I was saying**
While I remember	**Before I forget**	**Talking on which**

Or these sentence starters:

Do you mind if I…?	**The thing is, …**	**Do you happen to know…?**
Do you think you could…?	**Would it be Ok if I…?**	

Or social formulas and useful expressions:

How do you do?	**See you later**	**Just looking, thanks.**
Can I take a message?	**How do you spell that?**	

Or catchphrases and idiomatic phrases:

Better late than never	**Long time no see**	**Look who is talking**
It is on the tip of my tongue	**The sooner the better**	

By both memorizing these chunks gaining control over their fluent articulation, learners are increasing their fluency store. As we see fluency is the capacity to string long runs together, with appropriately placed pausing. This in turn is partly a function having a store of memorized phrases, or chunks, that act as "islands of reliability", on which the speaker can momentarily rest while planning the next run. Drilling may help in the storing and in the retrieving of these chunks as whole units. In this sense, drilling, in effect, is aimed primarily at developing accuracy.

As a general rule of thumb, drilling involves quick choral i.e. (all the class) repetition of the teachers model (or a recorded model on tape), followed by individuals randomly nominated by the teacher. It is important that the learners mimic the stress and information of the model: there is a world of difference between How do you spell that and How do you spell that, for example.

For the phrases with "empty slots", such as sentence starts, the teacher can provide prompts to fill the slot. For example:

Teacher: Do you mind if I sit here?
Student 1: Do you mind if I sit here?
Teacher: Smoke
Student 2: Do you mind if I smoke?
Teacher: Open the window
Student 3: Do you mind if I open the window? etc.

Here, then, are some techniques that involve either individual or choral repetition:

Drilling –the learners are played a recording of an interaction, in which are embedded a number of useful chunk-type items, such as formulaic ways of expressing specific speech acts. After working on their understanding of the dialogue, they are given the transcript. The recording is played again, but the teacher pauses it at strategic points, and the learners repeat the immediately preceding utterance in unison, and then individually. Only key phrases are repeated, not the whole dialogue. Here, for example, is how part of the above mentioned dialogue might be used:

Recording	**Students**
A: Hey, Barry, what a great tie! **B: Thanks. Actually, I have had it for ages, but I have never wear it.**	
A: It suits you. {pause}	**(chorus) It suits you.** **(individual 1) It suits you.** **(individual 2) It suits you.** **(individual 3) It suits you.**
Listen, Barry. I was thinking, do you fancy lunch together some time this week?	
B: That would be nice.{pause}	**(chorus) That would be nice.** **(individual 1) That would be nice** **(individual 2) That would be nice** **(individual 3) That would be nice.**
What about Friday? **A: Perfect. Do you mind if I ask Jackie?** **B: Well, actually, I am sorry AI.**	
I would rather, you did not. {pause}	**(chorus) I would rather you did not.** **(individual 1) I would rather you did not.** **(individual 2) I would rather you did not.** **(individual 3) I would rather you did not.**
Etc.	

As further reinforcement, learners could be asked to underline the drilled segments on the transcript and to mark the main stressed words in each segment. They can then read the dialogues aloud, paying special attention to the underlined sections.

Chants – a more playful form of practice that replicates the repeating and chunking nature of drilling is the use of chants. And because they are contextualized, the chunks in chants may in fact be more memorable than in standard drills. After all, many learners are familiar with catchphrases and idiomatic one-liners from having picked them up listening to pop songs or playing computer games. To work best, the chants should incorporate repeated examples of short, multi-word sequences, and should have a consistent rhythm. It helps if the chants have been prerecorded. Here, for example, is a chant that embeds a number of narrating expressions:

A funny thing happened…
What happened?
A funny thing happened to Lee.
It is funny how thinks like that happen.
The same thing happens to me.
An awful thing happened…
What happened?
An awful thing happened to Jim.
It is awful how things like that happen.
The same thing happened to him.

Having heard it a few times, learners can attempt to reconstruct it in written form, before chanting it in unison. If there is a dialogic element, as in the above chant, the class can be divided in two, each half taking alternate lines. The chanting should be relatively fast, regular, and rhythmic. (Asking learners to mark the main stressed words helps) Then they can try substituting elements to produce new "verses", using prompts, such as:

Scary…Gus…us creepy…fleur…her…
crazy…Clem…them

Writing tasks

It may seem strange to have a section on writing in a book that is about speaking. Bur writing has a useful role to play as an initial stage in the appropriation of newly encountered language to using. Inevitably, because of the constraints placed on mental processing by the demands of real-time speaking, learners tend to rely on a very narrow repertoire of memorized expressions in face-to-face interaction. So, an important function of classroom speaking activities is to help learners extend their range of such features. To do this, it may sometimes help to reduce the processing demands placed on them in order to give them time to consciously access alternatives to their habitual repertoire. One way of "slowing down" processing is to turn the speaking task into a writing one. Here are some ways of doing that;

Dictation, paper conversations, computer- mediated chat, rewriting and so on.

Conclusion

In this article we have looked at some ways that Learners may achieve greater control over their own speaking through classroom processes of appropriation. Activities aimed at appropriation provide learners with a supportive framework in which they can practice control. The support may take the form of:

- A model, which is repeated, as in drills or chants.
- A writing task, which allows longer processing time than does "live" speaking
- Reading aloud from a text

We have now looked at two of the stages of our three-stage model of skills development awareness and appropriation and in our future works we are going to discuss the other models of skill development.

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ASSESSİNG EL LEARNERS: HOW TO ASSESS SPEAKİNG

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ABSTRACT

The article is about assessing English Language learners during the speaking process. Here the authors shows the importance of assessing our students speaking abilities both in class and in formal speaking exam. At the same time they show some of the things the teachers do in order to ensure valid and reliable speaking assessment. The authors introduce speaking ways of assessing, including speaking categories of oral skills, special issues in speaking assessment and a range of assessment tasks.

Keywords: assessment, accurasy, fluency, speaking exams, communication.

As in daily life, speaking is an important channel of communication in a general English program. When testing this skill, we want to simulate real life situations in which students engage in conversation, ask and answer questions, and give information. In an academic English proqram, the emphasis may shift to participating in class discussions and debates or giving academic presentations. In a business English course, students might develop telephone skills, make reports, and interact to common situations involving meetings, travel, and sales. Whatever the teaching focus, valid assessment should reflect the course objectives.

We know the importance most students place on being able to speak proficiently, so we assess our students speaking abilities both in class and in formal speaking exam. Some of the things we do in order to ensure valid and reliable speakinh assessment are:

- We start any speaking assessment with an unassessed warm-up to reduce nervousness
- We conducts our speaking exams with another teacher so that each has a specific role
- We use a range of assessment tasks
- We focuses on both fluency and accurasy when marking students speech
- We records exams so that we have a record of them for later reference
- We limit the nimber of speaking exams per day to ensure ntra-rater reliability
- We conduct regular calibration sessions with other teachers to ensure inter-rater reliability.

Heaton points out that speaking is “an extremely difficult skill to test, as it is far too complex a skill to permit any reliable analysis to be made for the purpose of objective testing”.[1,p.112] The greaters challenges are resource requirements and reliability, including the perceived subjectivity in grading. Lack of time, nimber of students, lack of available tests, and adminstrative difficulties are other pressing concerns. In addition, practicality issues for reliability of the marking often arise as raters must be trained, and this training can be very time consuming For all these reason, many teachers do not even attempt to acssess speaking. However, the assessment of spoken language has evolved dramatically over the last several decades from tests of oral grammar and pronunciation to tests of genuine communication, and now to inteqrative speaking tasks on high-stakes tests like the TOEFL and TOEIC.

Speaking is a complex skill requiring the simultaneious use of different abilities that often develop at different rates-namely prononciation, grammar, vocabulary, fluency and comprehension. These abilities still underlie the assessment of speaking, but not more attention is paid to contextual and interactional factors.

Canale and Swain argue there are four competencies underlying speaking ability:

*Grammatical competence: includes knowledge of grammar, vocabulary and mechanics

*Discourse competence: concerned with relationships beyond the sentence level, rules of cohesion and coherence, holding communication together in a meaningful way

*Sosiolinguistic competence: applying knowledge of what is expected socially and culturally by users of the target language

*Strategic competence: “the way learners manipulate language in order to meet communicative goals” [2, p.228] the ability to know when to take the floor, how to keep a conversation going or end it, and how to resolve communication breakdowns.

Categories of Oral Skills

We categorises oral skills as speaking skills that are part of a repertoire of routines for exchanging information or interacting, and improvisational skills such as negotiating meaning and managing the interaction. The routine skills are lagely associated with language functions and the spoken language required in certain situations like ordering food in a restaurant or asking for directions to a museum. By contrast, the improvisational skills are more general and may be brought into play at any tome for clarification, to keep a conversation flowing, to change topics, or to take turns. It is the teachers task to decide which speaking skills are most germane to a particular program and then create a variety of assessment tasks. It is also common to weight some skills more heavily than others.

Before we focus specially on assessing speaking, it is necessary to understand some of the differences between the two productive language skills- writing and speaking. We have already seen that subjectivity is a major issue in grading writing and that is also the case for assessing speaking. As with writing, there is the issue of whether to grade speaking holistically or analytically. [3, 201]

Writing	Speaking
Full, complex, and well-organized sentences	Incomplete, simply and loosely organized sentences
Information densely packed	Simpler discourse with less information
Use of specific vocabulary	Use of more general vocabulary
Use of discourse markers to help the reader	Frequent use of fillers to facilitate speech
Text written for an unseen audience	Face-to-face communication
A relatively solitary process	Neqotiation of meaning between two or more people
Alterations and crossings out kept to a minimum	Alterations, corrections, and miscues are very common
Reference can easily be made to what has been written previously	Memory limitations are important as speech is transitory

These differences are fundamental to our understanding of the construct of speaking and any assessment of this skill must take these features into consideration.

In contrast to writing, speaking is more ephemeral unless measures are taken to record student performance. Yet the presence of recording equipment can neqatively influence students performance and often recording is not practical or feasible.

Special Issues in Speaking Assessment

Logistically, the administration of speaking exams to large numbers of students can be overhelming in terms of time and resources. With large classes, it is unrealistic to test speaking individually. For example, to test a class of 30 students individually, it would take more than four class periods to admimster a 10-to 15-minute speaking exam. One solution is to develop assessments that test more than one student at a time, yet allow each student some oppotunities to speak individually. Another solution is to test, formally only a few times during a course but to use continuous assessment of students during normal classroom activities.

Another phenomenon in speaking assessment is that sometimes a student can score higher on exams because of having an outgoing personality. Take care to evaluate a student on what was said in the exam, not on personality.

A number of factors need to be considered before designing speaking assessments. One is weather to focus more on fluency or accuracy. On the one hand, fluency is important for students, but if there are many errors, that might impede comprehension. We reccomended that you focus equality on fluency and accuracy. Ask yourself whether the mistakes students make impede comprehension or causea breakdown in communication. If they do not, ignore or play down the problems. One way to ensure that you place an equal focus on both fluency and accuracy is to build this into your assessment criteria. In other words, 50 percent of a students grade would come from aspects of fluency such as initiating and maintaining communication and 5- percent would be based on how accurately the student spoke.

Teachers also have to decide on which criteria to evaluate. If you expouse an equal emphasis on fluency and accuracy, we recommend the following marking categories; accuracy (grammar), vocabulary, linguistic ability (prononciation, intonation and stress).

Another factor to consider before you design your assessment is the procedure for grading. Since subjectivity is a major problem in marking speaking exams, a common solution is to use multiple raters. The more teachers you use, the more reliable a test score will be. It is common pracrice to use two raters with different roles for speaking exams. One teacher, the interlocutor, intracts with the student or students being tested. The other teacher, the assessor, focuses on writing scores.

Debate on a controversial Topic

A debate is a formal public speaking activity where two students or groups of students argue for or against a topic. The topic they debate is called the motion. The student who argues for the motion usually starts the debate with a three-minute speech. The student on the opposing team then has a chance to argue againsr or rebut the arguments made by the first student. Group or team debates in which two teams of four students argue for and against a certain motion are preffered. Three students on each team deliver oral arguments. The remaining student serves as a silent observer who helps formulate the arguments or rebuttal statements.

Sample debate topics:

*Cigarette smoking should be banned in all public places.

*The legal driving are should be raised to 21.

*Men and women can never be just friends.

Here is a sample grading form for three students, each of whom is graded individually before a group grade is given.

Grading chat for Three-Student Debate
The motion_____

Content	Mark	Speaker 1 Names:	Speaker 2 Names:
The speaker developed strong, well-supported arguments and successfully Rebutted opponents arguments if applicable	**10/9**		
The speaker developed well-supported arguments and guite successfully rebutted opponents arguments if applicable	**8/7**		
The speaker developed satisfactory arguments, competently supported, and rebutted a number of the opponents arguments if applicable	**6/5**		
The speaker developedweak, poorly supported arguments and tried generally unsuccessfully to rebut opponents arguments if applicable	**4/5**		
The speaker developed largely irrelevant arguments and rebutted none of the opponents arguments if applicable	**2/1**		

Conclusion

The teachers should remember these things about speaking assessment:

1. **Choose tasks that generate positive washback for teaching and learning**

Select speaking assessment tasks that have a positive effect on the teaching and learning process. These tasks should be authentic as possible.

2. **Allow time for a warm-up.**

A warm-up will probably improve results. Speaking tests can be traumatic for second language learners. Use the warm-up activity to put students at ease.

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THE IMPORTANCE OF CORRECT EVALUATION OF PILOTS AND ATCOS OF THEIR ENGLISH LEVEL ACCORDING TO ICAO

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ABSTRACT

Effective communication in aviation is a critical safety factor, particularly in interactions between pilots and air traffic controllers (ATCOs). The International Civil Aviation Organization (ICAO) has established Language Proficiency Requirements (LPRs) to mitigate risks associated with language-related misunderstandings. This article examines the importance of correct evaluation of pilots' and ATCOs' English language proficiency according to ICAO standards, with particular emphasis on operational relevance, plain language use, and radiotelephony communication. It explores the ICAO rating scale, assessment principles, examiner and rater responsibilities, and validity periods, and highlights the risks arising from inadequate language competence. Special attention is given to problems caused by poor knowledge of English in non-routine and emergency situations, where reliance on plain language is essential. The article argues that accurate, fair, and scenario-based language assessment is a key element of global aviation safety and a fundamental responsibility of civil aviation authorities.

Keywords: ICAO language proficiency; aviation English; pilots; air traffic controllers; plain language; radiotelephony communication; language testing; aviation safety.

Effective communication between pilots and air traffic controllers (ATCOs) is universally recognized as a cornerstone of aviation safety. In an industry characterized by international operations, multicultural crews, and high workload environments, the ability to communicate clearly and accurately is essential. English has been designated by the International Civil Aviation Organization (ICAO) as the international language of aviation radiotelephony, and its correct use is critical for the safe and efficient conduct of flight operations. Consequently, the correct evaluation of pilots' and ATCOs' English language proficiency is not only a regulatory obligation but a fundamental safety requirement.

Historically, several major aviation accidents and serious incidents have demonstrated that language-related misunderstandings can have catastrophic consequences. Investigations revealed that inadequate comprehension, non-standard phraseology, and insufficient plain language skills contributed to breakdowns in pilot–controller communication. In response to these safety concerns, ICAO introduced Language Proficiency Requirements (LPRs), which are formally contained in Annex 1 to the Convention on International Civil Aviation and further detailed in ICAO Document 9835, Manual on the Implementation of ICAO Language Proficiency Requirements.

The primary objective of ICAO language proficiency testing is to assess operational spoken language ability rather than theoretical or academic knowledge of English. ICAO explicitly emphasizes that testing must focus on real-life communicative competence in aviation contexts. This includes the ability to understand and produce language accurately, fluently, and appropriately during routine operations as well as during abnormal and emergency situations. Correct evaluation ensures that pilots and ATCOs can manage unexpected events, resolve misunderstandings, and maintain situational awareness through effective communication.

ICAO established a six-level language proficiency rating scale, ranging from Level 1 (Pre-Elementary) to Level 6 (Expert). Of these, Levels 4 (Operational), 5 (Extended), and 6 (Expert) are considered acceptable for operational use. Candidates are evaluated against six equally weighted language skill areas: pronunciation, structure, vocabulary, fluency, comprehension, and interactions. A key principle of ICAO assessment is that the overall proficiency level is determined by the lowest score achieved in any of these areas. This approach reflects the operational reality that weakness in a single skill can compromise communication safety as a whole.

Correct evaluation requires that test tasks are operationally relevant and representative of real aviation communication. ICAO guidance stresses the importance of including both standard ICAO phraseology and plain language. While phraseology is designed to enhance clarity and reduce ambiguity, it is not sufficient in all situations. Pilots and ATCOs must demonstrate the ability to transition to plain English when handling non-routine events, technical failures, weather deviations, or emergency scenarios. Tests that rely excessively on memorized phraseology fail to capture this critical competence and undermine assessment validity.

Another essential aspect of correct evaluation is the role of examiners and raters. ICAO distinguishes clearly between these functions: examiners interact with candidates and administer the test, while raters evaluate and score performance using ICAO descriptors. To ensure reliability and objectivity, ICAO recommends standardized rater training, regular refresher courses, and robust quality assurance mechanisms. The avoidance of conflicts of interest, such as instructors assessing their own students, is fundamental to maintaining the credibility of the testing system.

The validity of ICAO language proficiency endorsements is also strictly regulated. ICAO specifies that Level 4 proficiency is valid for three years, Level 5 for six years, and Level 6 for life. These validity periods recognize that language proficiency can deteriorate over time if not actively used. Recurrent testing at appropriate intervals ensures that pilots and ATCOs maintain the required level of operational communication competence throughout their careers.

Despite comprehensive ICAO guidance, challenges remain in the global implementation of language proficiency testing. Variations in test design, inconsistent rater practices, insufficient assessment of interaction and comprehension, and administrative pressures can negatively affect the accuracy of evaluations. These challenges underline the responsibility of national civil aviation authorities to oversee approved testing systems, conduct audits, and ensure full compliance with ICAO standards.

In conclusion, the correct evaluation of pilots' and ATCOs' English language proficiency according to ICAO requirements is an indispensable element of aviation safety management. Accurate, fair, and operationally relevant assessment supports effective communication, reduces the risk of misunderstandings, and enhances the overall safety and efficiency of international air operations. Proper implementation of ICAO language proficiency testing represents not only regulatory compliance but a commitment to the highest standards of global aviation safety.

Problems Arising from Poor Knowledge of English in Plain Language and Radiotelephony Communication

Despite the existence of standardized ICAO phraseology and internationally accepted language proficiency requirements, inadequate knowledge of English continues to pose serious risks to aviation safety. Problems most frequently arise not during routine operations, where phraseology is predictable, but in non-routine, abnormal, or emergency situations that require the use of plain language. In such circumstances, insufficient language proficiency can lead to misunderstandings, delayed responses, and incorrect actions with potentially severe consequences.

One of the most common problems associated with poor plain English proficiency is incomplete or incorrect comprehension. Pilots or ATCOs with limited language skills may understand individual words but fail to grasp the full meaning or intent of a message. This can result in incorrect readbacks, failure to comply with clearances, or inappropriate responses to traffic instructions. In high workload environments, even small comprehension errors can escalate rapidly into serious safety threats.

Another significant issue is the inability to clarify or resolve misunderstandings. ICAO emphasizes interaction as a critical skill area, requiring aviation personnel to ask for clarification, confirm information, and negotiate meaning when communication is unclear. Individuals with weak English proficiency often avoid asking for clarification due to lack of confidence or limited linguistic resources. This reluctance can lead to assumptions being made instead of verified, increasing the risk of operational errors.

Poor fluency and limited vocabulary further complicate radiotelephony communication. Hesitations, long pauses, and incorrect word choices can disrupt the flow of communication and increase frequency congestion. In emergency situations, where time is critical, delayed or unclear messages can prevent ATCOs from providing timely assistance or coordinating effective responses with other aircraft and emergency services.

Pronunciation problems also represent a major source of miscommunication. Non-standard pronunciation, strong accent interference, or incorrect stress patterns can make messages difficult to understand, particularly over radio transmissions affected by noise, signal distortion, or poor audio quality. ICAO requires that pronunciation be intelligible to the international aviation community; failure to meet this requirement compromises mutual understanding and operational safety.

In radiotelephony communication, over-reliance on memorized phraseology without genuine language competence presents another serious problem. While standard phraseology enhances safety, it cannot cover every possible scenario. When pilots or ATCOs lack sufficient plain English skills, they may attempt to force non-standard situations into inappropriate phraseology or remain silent when unable to express the problem clearly. This limitation reduces situational awareness and increases the likelihood of misinterpretation.

Historical accident and incident investigations have repeatedly demonstrated the consequences of poor English proficiency. Communication breakdowns have been linked to runway incursions, altitude deviations, loss of separation, and inadequate response to emergency situations. These cases underline that language proficiency is not an academic issue but an operational safety factor directly affecting human performance.

Furthermore, cultural and linguistic interference can exacerbate language-related problems. Direct translation from a native language, use of non-standard structures, or culturally influenced communication styles may conflict with the concise and unambiguous nature required in aviation English. Without proper assessment and training, such interference remains undetected and uncorrected.

From a testing perspective, inadequate evaluation of plain language and radiotelephony competence can allow insufficiently proficient personnel to be certified at an operational level. Tests that focus excessively on scripted responses or predictable scenarios fail to reveal weaknesses in interaction, comprehension, and spontaneous speech. This highlights the importance of comprehensive, scenario-based assessment aligned with ICAO guidance.

In conclusion, poor knowledge of English in both plain language and radiotelephony communication creates multiple layers of risk in aviation operations. Accurate assessment and continuous monitoring of language proficiency are essential to identify deficiencies and ensure that pilots and ATCOs possess the communicative competence necessary to manage both routine and non-routine situations safely. Strengthening evaluation practices in line with ICAO standards directly contributes to reducing communication-related incidents and enhancing global aviation safety.

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ПРИРОДНИЧО-НАУКОВА СКЛАДОВА ВИРОБНИЧО-ТЕХНІЧНОЇ ОРІЄНТАЦІЇ МАЙБУТНЬОГО ФАХІВЦЯ МАШИНОБУДІВНИХ ТЕХНОЛОГІЙ

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NATURAL SCIENCE COMPONENT OF THE PRODUCTION AND TECHNICAL ORIENTATION OF A FUTURE SPECIALIST IN MECHANICAL ENGINEERING TECHNOLOGIES

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АНОТАЦІЯ

Проаналізовано роль природничо-наукової підготовки в системі професійної підготовки. Визначено основні компоненти природничо-наукової складової виробничо-технічної орієнтації майбутнього фахівця машинобудівних технологій. Встановлено основні засоби здійснення професійної спрямованості при викладанні дисциплін природничо-математичного циклу.

ABSTRACT

The role of natural science training in the system of professional training is analyzed. The main components of the natural science component of the production and technical orientation of a future specialist in mechanical engineering technologies are determined. The main means of implementing professional orientation in teaching subjects of the natural science and mathematics cycle have been established.

Ключові слова: природничо-наукова підготовка, виробничо-технічна орієнтація, професійно-технічна підготовка.

Keywords: natural science training, industrial and technical orientation, vocational and technical training.

Зміни в системі сучасної професійно-технічної освіти, орієнтованої на вимоги інформатизації всіх сфер українського суспільства, висувають все більші вимоги до якості підготовки майбутніх фахівців, диктують необхідність підготовки творчо мислячих людей, так як сучасне виробництво потребує не простих виконавців, а творчих працівників здатних ефективно вирішувати поставлені завдання та переносити знання з одних технічних об'єктів на інші, вільно орієнтуватись у сучасних технічних засобах і ін..

Проведення аналізу наукових праць підтверджує наявність глибоких теоретико-практичних напрацювань щодо природничо-наукової, загальнотехнічної та професійної підготовки студентської молоді, вдосконалення навчального процесу у професійно-технічних навчальних закладах, серед яких слід виокремити дослідження П.Атутова, А. В. Антонець, С. Батишева, Й. Гушулея, М. Думченка, Т. Кудрявцева, Л. В. Моторної, В. Ледньова та ін... Тобто на сучасному етапі накопичено значний досвід підготовки майбутніх фахівців у професійно-технічних навчальних закладах та закладах фахової передвищої освіти, але все ж залишається малодослідженою проблема природничо-наукової складової виробничо-технічної орієнтації майбутнього фахівця машинобудівних технологій.

Метою статті є висвітлити особливості природничо-наукової підготовки як одного із компонентів виробничо-технічної орієнтації майбутнього фахівця машинобудівних технологій в процесі професійної підготовки.

Виробничо-технічна орієнтація містить у собі три взаємопов'язані складові (природничо-наукову, загальнотехнічну, професійну) і визначається як складова професійної діяльності сучасного робітника, що передбачає здатність вільно орієнтуватися в сучасному технічному середовищі, а також готовність до застосування сучасних технічних систем у процесі виконання професійних функцій. Складові виробничо-технічної орієнтації передбачають формування системи загальнотрудових, загальновиробничих і спеціальних знань, умінь, навичок та звичок у процесі професійної підготовки.

Кожна складова містить у собі певні компоненти. Функції окремих компонентів виробничо-технічної орієнтації визначаються їх завданнями та змістом. Питання природничо-наукової підготовки майбутніх фахівців як компонентної складової виробничо-технічної орієнтації фахівця машинобудівних технологій у процесі професійної підготовки не було об'єктом окремого наукового дослідження, але є актуальним і потребує подальшого дослідження.

Природничо-наукова підготовка є невід'ємною складовою в системі професійно-технічної освіти. Науковці вважають, що вона суттєво впливає на формування особистості та професійні якості майбутнього фахівця, рівень його мобільності, конкурентноспроможності та затребуваності на сучасному ринку праці. На предмети природничо-наукового циклу покладається основна відповідальність за формування в майбутніх фахівців картини світу як найважливішого елемента наукового світогляду [4]. Природничо-наукова підготовка, як наголошує Л. В. Моторна, є основою для засвоєння спеціальних дисциплін, оволодіння професією, застосування природничо-наукових знань у майбутній професійній діяльності

і виступає, як інтегративна характеристика, що передбачає здатність вирішувати навчальні і професійні завдання, використовуючи природничо-наукові знання та уміння [5, с.11].

А.В. Антонець зазначає, що природничо-наукові дисципліни є базовими для отримання спеціальних знань під час навчання у закладах професійно-технічної освіти. Він вважає, що природничо-наукова підготовка впливає на формування прогностичних умінь майбутніх фахівців; формуванню умінь проводити експеримент, пояснювати й оформляти його результати; оволодінню загальними ідеями й принципами природничо-наукових знань; формуванню умінь розглядати явища й процеси у взаємозв'язку, формуванню здатності до усвідомлення причинно-наслідкових зв'язків; розвитку рефлексивного мислення, творчої активності, здатності до інтуїтивного мислення [1, с. 82].

Узагальнюючи думки А. В. Антонця, О. В. Єлісеєва, Л. В. Моторної та ін. ми робимо висновок, що природничо-наукова підготовка є цілеспрямованим процесом, результатом якого є формування у майбутніх фахівців системи фундаментальних природничо-наукових знань, умінь, навичок, досвіду пізнавальної та практичної діяльності, що є невід'ємним компонентом формування виробничо-технічної орієнтації у професійній підготовці.

Водночас результати аналізу досліджень С. О. Касярум, Т. С. Нінова, С. О. Панічева та інших свідчать про наявність проблем та протиріч у природничо-науковій підготовці майбутніх фахівців, а саме: недостатній рівень професійної спрямованості при вивченні природничо-наукових дисциплін, оскільки студенти не розуміють значення природничо-наукових знань у подальшій професійній підготовці; відсутністю у змісті природничо-наукових дисциплін задач прикладного характеру, які пов'язані зі змістом майбутньої професійної діяльності; не розробленістю професійно спрямованих методик і рекомендацій з викладання природничо-наукових дисциплін та ін. [4, с. 142].

Ми поділяємо такий погляд і вважаємо, що під час визначення необхідної та достатньої сукупності знань і вмінь природничо-наукового змісту потрібно виходити із професійних потреб фахівця машинобудівних технологій, так як, ізольоване вивчення окремих предметів, передбачених навчальними планами професійно-технічних навчальних закладів та закладів фахової передвищої освіти, не може позитивно розв'язувати питання формування системи знань, умінь і навичок, використання їх на практиці. Тут необхідно здійснювати міжпредметні зв'язки в процесі навчання молоді і формуванні їх професійних функцій. Професійна спрямованість природничо-наукових дисциплін, які вивчаються в професійно-технічних закладах освіти та в закладах фахової передвищої освіти, дає змогу органічно поєднувати вивчення загальноосвітніх предметів і спеціальних дисциплін, зберігаючи викладання основ наук у тому самому обсязі і глибині, що й в школі, але з застосуванням знань при оволодінні конкретною спеціальністю. У цьому випадку природничо-наукова складова сприятиме формуванню виробничо-технічної орієнтації. Одним із першочергових завдань, що постали перед викладачами є досягнення того, щоб кожний студент під час вивчення природничо-наукових дисциплін чітко усвідомлював значущість та необхідність засвоєння змісту навчального матеріалу. Так, як сучасний фахівець, зайнятий в автоматизованому виробництві, повинен мати достатньо високий рівень природничо-наукової підготовки, щоб бути здатним до сприйняття правильної і поглибленої виробничо-технічної інформації. Як наголошує П. Атутов «… природничо-наукові знання сучасної техніки мають певні ознаки, які: а) лежать в основі різноманітності знарядь праці; б) формуються на основі засвоєння законів і понять різних наук; в) носять динамічний характер…» [2, с. 27]. Такі знання виступають мірою оволодіння типовими сторонами технічних об'єктів та їх науковими основами. Оскільки ці знання формуються у певній діяльності, а остання організовується за допомогою різних завдань, слід розробити систему відповідних завдань. Теорія навчальної діяльності Гушулея Й. [3] передбачає постановку таких навчальних задач, розв'язання яких повинно забезпечувати засвоєння узагальненого способу діяльності як прямого продукту навчальної діяльності. Науково-технічними завданнями у нашому випадку можуть бути спрощені моделі виробничо-технічних завдань, які доводиться найчастіше розв'язувати робітниками, що мають справу з технікою.

У системі професійно-технічної освіти та фахової передвищої освіти природничо-наукова складова виробничо-технічної орієнтації реалізується через цикл математично-природничих дисциплін, які розкривають сутність явищ навколишнього середовища, його внутрішні закони, виходячи із свого предметного уявлення про природу. При вивченні дисциплін даного циклу забезпечується набуття майбутніми фахівцями фундаментальних природничо-наукових знань, досвіду пізнавальної та практичної діяльності які є основою для засвоєння дисциплін циклу професійної і практичної підготовки та оволодінню майбутньою професією. Тому в процесі дослідження зроблено висновок, що для якісної професійної підготовки майбутніх фахівців машинобудівних технологій, природничо-наукова складова виробничо-технічної орієнтації повинна містити в собі: розуміння наукових положень, понять, пов'язаних з технікою; знання загальних виробничо-технічних функцій сучасного робітника; розуміння загальних способів технології різних виробничих процесів (рис. 1.).

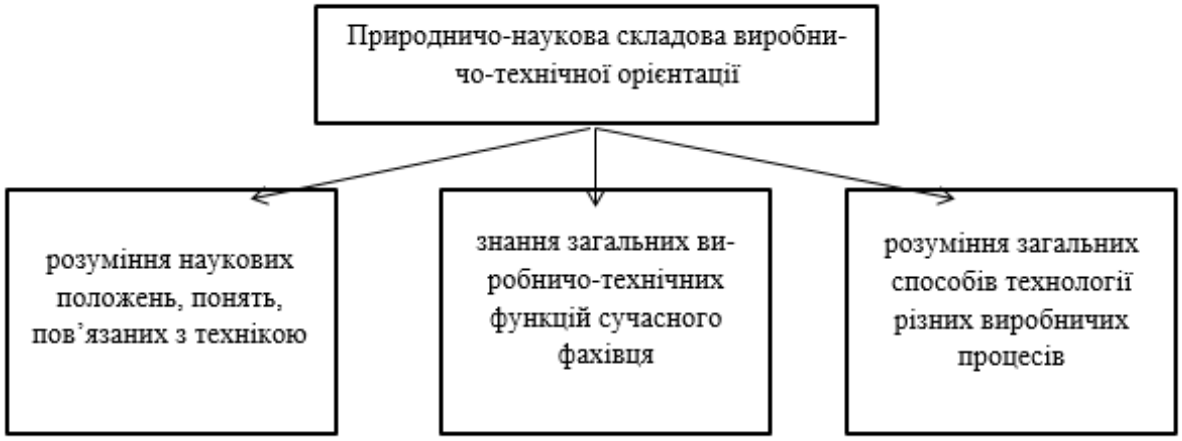
Природничо-наукова складова виробничо-технічної орієнтації
розуміння наукових положень, понять, пов'язаних з технікою
знання загальних виробничо-технічних функцій сучасного фахівця
розуміння загальних способів технології різних виробничих процесів

Рис. 1. Природничо-наукова складова виробничо-технічної орієнтації

Природничо-наукова складова виробничо-технічної орієнтації фахівця передбачає такі знання наукових основ функціонального принципу, які відповідають деякому рівню розгляду технічного об'єкта. Наукова основа технічного об'єкта переважно проявляється у формі будь-якого принципу. У цьому випадку ми маємо науковий (фізичний, хімічний, біологічний і ін.) принцип функціонування об'єкта. Конкретним прикладом відмінності функціонального принципу від наукового може бути функціональний принцип електричних датчиків для вимірювання тиску, побудованих на сегнетоелектриках. Він полягає в наступному. Якщо до платівки сегнетоелектрика прикладати механічні зусилля, стискаючи або розтягуючи її, то на протилежних поверхнях пластинки будуть наводитися електричні заряди різного знака. Виникає явище, зване «прямим п'єзоефектом». В процесі таких впливів платівка сегнетоелектрика стає джерелом ЕРС, що і фіксується датчиком як деякий тиск. Функціональний принцип даного пристрою побудований на прямому п'єзоефекті.

Конкретизація навчального матеріалу дисциплін природничо-наукового циклу відповідно до спеціальності майбутнього фахівця є необхідною умовою для формування професійних знань, умінь та навичок. Основні поняття, явища, закони докладно вивчаються на заняттях природничо-математичного циклу, а на заняттях з спецпредметів та виробничого навчання, практик поглиблюються, використовуються для пояснення виробничих процесів. На основі вивченої педагогічної літератури, до основних засобів здійснення професійної спрямованості при викладанні природничо-математичних дисциплін ми відносимо: розкриття наукових основ технологічних процесів та їхніх складових частин; використання безпосередньо знань з одного предмета при поясненні нового матеріалу з іншого; розв'язування задач якісного, кількісного і експериментального характеру з професійним змістом на заняттях природничо-математичного циклу і навпаки; проведення комплексних лабораторно-практичних робіт, демонстраційних дослідів, організація екскурсій на базове підприємство; використання міжпредметних комплексних робіт; використання на заняттях природничо-математичного циклу прикладів, пов'язаних з продуктивною працею студентів та діяльністю підприємства, а також виробничо-технічною тематикою тощо.

Враховуючи обмежені можливості кожного окремо взятого засобу реалізації професійної спрямованості, успіху можна досягти тільки при сукупному використанні цих засобів. А це, в свою чергу, сприятиме творчій активності викладачів природничо-математичних дисциплін, спецпредметів та майстрів виробничого навчання у впровадженні ідей професійної спрямованості, використання знань з фізики, математики, хімії і інших на спеціальних уроках, підвищенню природничо-наукового рівня викладання дисциплін професійного циклу.

В основу сучасного виробництва покладено закономірності природничо-математичних наук, тому для формування в студентів системи знань, які є в основі техніки і технології виробництва, слід спиратись на зв'язок з усіма дисциплінами навчального плану. Для цього при вивченні тем навчальних дисциплін природничо-математичного циклу необхідно наводити наочні приклади застосування основних понять, положень у професійній діяльності. Тут беззаперечними помічниками виступають сучасні освітні технології, інтерактивні методи навчання (метод проектів, ділові ігри, комп'ютерні тренінги, кейс-метод, мультимедійні алгоритми і інші), сучасні засоби навчання, такі як: навчальна техніка (принтер, сканер, проектор тощо), що розширює спектр та ефективність застосування комп'ютерної техніки; програмно-методичні комплекси (комп'ютерні навчальні програми); мережевне та телекомунікаційне обладнання; екранно-звукові засоби навчання; лабораторне обладнання; навчальні прилади та інструменти тощо.

Результати теоретичного узагальнення дозволяють бачити структуру природничо-наукової складової виробничо-технічної орієнтації майбутніх робітників механічних технологій в єдності трьох компонентів: мотиваційного, змістового та операційного. Критерієм мотиваційного компоне-

нту є спрямованість на вивчення природничо-наукових дисциплін (інтенсивність емоцій, бажань стосовно опанування природничо-науковими дисциплінами; прагнення студентів збирати і досліджувати теоретичний і практичний матеріал з природничих дисциплін, який послугує для здобуття базових професійних знань; усвідомлення студентами практичної значущості природничо-наукової підготовки у майбутній професійній діяльності); змістового − якість знань з циклу природничо-наукових дисциплін з їх перенесенням на технічні дисципліни (рівень теоретичних знань з природничо-наукових дисциплін; знання про особливості застосування природничо-наукових знань у майбутній професійній діяльності; уміння студентів аналізувати, синтезувати, узагальнювати, формулювати і розв'язувати завдання, експериментувати, вносити раціоналізаторські пропозиції тощо); операційного − сформованість професійно значущих умінь і навичок з природничо-наукових дисциплін (уміння студентів застосовувати одержані природничо-наукові знання при розв'язанні прикладних задач в процесі вивчення спеціальних дисциплін (та в професійній діяльності); ступінь творчості у використанні природничо-наукових знань у нових професійних ситуаціях.).

В ході констатувального етапу експерименту виявлено високий рівень розуміння майбутніми фахівцями необхідності вивчення дисциплін природничо-математичного циклу. 82% опитаних вважають, що вивчення дисциплін даного циклу є необхідною характеристикою професійних якостей сучасного фахівця. Водночас тільки 14% майбутніх фахівців вміють переносити знання отримані під час вивчення дисциплін природничого циклу на спецдисципліни, а 4% застосовують професійно значущі уміння на практиці.

Проведене дослідження не вичерпує всіх аспектів проблеми природничо-наукової підготовки, як одного із компонентів виробничо-технічної орієнтації. Перспективи подальших досліджень вбачаємо у з'ясуванні можливостей ефективного застосування нових інформаційних технологій у посиленні професійної спрямованості навчання дисциплін природничо-математичного циклу та розробленням на цій основі міжпредметних мультимедійних алгоритмів, які б демонстрували практичну значущість даних дисциплін у професійній діяльності майбутніх фахівців машинобудівних технологій

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PHILOLOGICAL SCIENCES

THE ANALYSIS OF DOUBLE MODALITY IN DISCOURSE

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ABSTRACT

This article examines double modality in discourse analysis. It shows how layered modal meanings function in spoken and written texts. The article analyzes double modality in authentic speech and texts, focuses on the interaction of main means of expressing double or triple modality such as modal verbs, modal words, mood, particles, inversion, intonation, interjections. It explores how speakers layer meaning through combined grammatical and lexical choices to express their opinions, especially complex judgments.

While modality has been extensively examined as a grammatical and semantic category, the roles of mood, inversion, intonation, and multiple modal expressions in discourse remain insufficiently explored. Drawing on data from both spontaneous spoken interaction and written English, including constructures such as *Had he known, he might have acted differently,* this study demonstrates how syntactic configurations (inverted mood structures), prosodic features, and modal verbs interact to construct layered modal meanings. These interactions enable speakers and writers to convey subtle pragmatic meanings, including uncertainty, obligation, politeness, and regret.

The article argues that double modality is not merely a rare grammatical feature but a versatile discursive strategy, used to layer interpersonal and evidential meanings across genres. Analysis integrates insights from Systemic Functional Linguistics, pragmatics, and modal theory, illustrating how grammatical, prosodic, and pragmatic resources interact in context. Real-life examples highlight its role in spoken discourse, narrative, journalism, and academic writing. Ultimately, this research opens new directions for studying modality beyond sentence-level grammar, suggesting future inquiry into multimodal signals (intonation, gesture) alongside textual analysis.

Keywords: Double modality, counterfactual action, text, intonation, inversion, discourse, layered modality, sentence-level grammar.

1. Introduction

In recent years, modality has attracted much interest in linguistics. Researchers study it in grammar, semantics, and pragmatics. It is used to express attitudes, judgments, and degrees of certainty. However, much existing research predominantly focuses on single modal elements—such as modal verbs (*can, may, must, should, would, will, dare)* or lexical modals (*perhaps, probably, certainly*)—often examined in isolation at the sentence level. In contrast, actual language use in discourse reveals far more complex modal patterns, including instances where two modal elements co-occur, a phenomenon known as **double modality**.

For the purposes of this study, double modality is understood as the co-occurrence of two modal elements—whether verbal, adjectival, adverbial, or semi-modal—within a single clause or utterance. Such combinations often yield meanings not reducible to their individual components. For example,

You *may have to* accept their point of view, but hope that they will take on board some of what you have said. (Collins Cobuild)

may have to → double modal
may→modal verb
have to →semi modal

This type of double modality is characteristic of Standard English.

In some cases, even three modal elements may combine, resulting in **triple modality**, which further enriches the interpretative possibilities. For example,

You *might oughto should* load the dishwasher before you go to bed, but you really oughta should unload it first.

might→modal verb
ought to→modal verb
should→modal verb

This type of double modality is characteristic of Non-Standard English.

Discourse is a context in which speakers and writers express how certain they are, how they relate to others, and how strongly they commit to what they say. Within this context, double modality is not just a grammatical form. It is a useful tool that helps express hesitation, emphasis, politeness, or emotional distance. For example,

He might possibly have misunderstood you.
might→modal verb
possibly→adverb expressing modality

The modal verb might and the adverb possibly are used together to show uncertainty and caution.

Similarly, in spoken English inversion is also used to express modality. (Nuriyeva, 2022) Similarly, spoken constructions like *Had he known, he might have helped* use inversion and modal verbs to show regret or a missed possibility. These meanings depend on the context and the speaker's intention.

Two examples illustrate the layered nature of double and even triple modality:

1. *They should be able to comport themselves as they want* (Collins Cobuild)

2. *Doctors should be able to decide who they can safely let out of hospital early* (Collins Cobuild)

In the first sentence, the modal verb *should* expresses obligation and expectation. At the same time, the semi-modal expression *be able to* conveys ability, a semantic domain often associated with *can*. The co-occurrence of these two modal elements creates a layered modal structure: the sentence does not merely state that the individuals are able to behave as they wish, but that they are expected or obliged to possess this ability. Thus, the utterance combines the notions of obligation/expectation and ability, exemplifying double modality.

The second example also demonstrates double modality, but in a more complex form. Here, *should* again conveys normative meaning, stressing the professional responsibility of doctors. The phrase *be able to* highlights the necessity of possessing the ability or competence to make such decisions. Moreover, within the complement clause, the additional modal verb *can* introduces a further layer of modality, related to the possibility or permissibility of discharging patients. As a result, the sentence contains not only double modality (*should* + *be able to*) but also an instance of triple modality (*should* + *be able to* + *can*). This layered structure expresses doctors are expected to have the ability to make decisions about what is safely possible, thus intertwining obligation, ability, and possibility within a single utterance.

What makes double modality different is that it has many sides. As it is mentioned it has multi-dimensional nature in discourse. It works through grammar, such as mood and inversion and the pragmatic aim of the speaker, including softening statements, showing possibilities, or strengthening opinions. Furthermore, the meaning of double modality also changes in different types of discourse, such as everyday speech, academic writing, journalism, or stories. While dialectal double modals such as *might could* or *should ought to* have been examined in varieties of English like Southern American or Scots, less emphasis has been placed on the layered combinations occurring in Standard English discourse, particularly in formal genres.

Accordingly, this study situates double modality within discourse analysis to investigate how syntactic structures (e.g., inversion) and modal elements interact across communicative contexts. By examining authentic usage, it aims to expand the understanding of modality as a discourse-sensitive phenomenon and underscores the importance of analyzing naturally occurring modal patterns beyond abstract grammatical models.

THEORETICAL BACKGROUND

2. Modality and Double Modality in English

2.1. Modality in Linguistic Theory

Modality has long been recognized as a central category in linguistics, situated at the intersection of grammar, semantics, and pragmatics. It broadly concerns the ways in which speakers express attitudes toward propositions, including assessments of necessity, possibility, obligation, and certainty (Palmer 2001; Lyons 1977). As such, modality functions not only as a grammatical phenomenon but also as a discourse-pragmatic resource, shaping how meaning is negotiated between interlocutors.

Traditional accounts often distinguish between three core types of modality: **epistemic, deontic, and dynamic**. (Palmer 2001; Coates 1983).

Epistemic modality relates to the degree of certainty or possibility with which a proposition is held to be true. E.g.,

She may be at home.

Deontic modality refers to necessity or permission imposed by rules, norms, or authority. E.g.

You must finish your homework.

Dynamic modality concerns ability, volition, or disposition internal to the subject. E.g.

He can play the piano.

Further classifications account for additional nuances. For instance, Nuyts (2001) highlights **evaluative modality**, where speakers judge the desirability or necessity of a state of affairs. E.g.

It is essential that we act now.

Similarly, Bybee, Perkins and Pagliuca (1994) take a typological approach and note that many languages use modal modal systems to express obligation, ability, and probability.

In addition to semantic distinctions, modality has been studied through its **grammatical realisations**, particularly the class of **modal auxiliaries** in English (*can, could, may, might, must, shall, should, will, would*), as well as **semi-modals** (*be able to, have to, need to, ought to*) and **lexical expressions** (*perhaps, possibly, likely*). These forms differ not only in syntax but also in the strength and scope of their modal force (Kratzer 1991; van der Auwera & Plungian 1998).

A key insight across these approaches is that modality is **inherently relational**: it reflects a speaker's stance toward a proposition relative to contextual factors, such as knowledge, norms, or abilities. This relationality provides the foundation for **double modality**, where multiple modal markers co-occur to produce layered or hybrid meanings.

2.2 Double Modality: Concept and Types

Double modality refers to the co-occurrence of two modal elements within a single clause, creating a **layered modal meaning** that combines different modal domains (Collins 2009; Nagle 2013). This phenomenon is not limited to standard forms; some non-standard or regional varieties of English also exploit it systematically (Di Paolo 1989; Mishoe & Montgomery 1994).

A classic example is found in **Southern American English** or **Scottish English**, with forms such as *might could* or *should ought* (Di Paolo 1989). In *You might could help him*, the first modal (*might*) expresses epistemic tentativeness, while the second (*could*) conveys dynamic ability, resulting in a meaning that cannot be conveyed by a single modal alone.

From a functional perspective, double modality allows speakers to **mitigate, intensify, or diversify modal meanings**. Epistemic–dynamic combinations (*may can, might could*) express tentative possibility linked to ability, while deontic–dynamic combinations (*should be able to*) highlight obligation tempered by capacity (Nuyts 2001; Collins 2009).

Typologically, two broad types of double modality are identified:

1. **Auxiliary–Auxiliary Combinations**: Two modal auxiliaries co-occur (*might could, may will,*

should ought). These are regionally marked and often stigmatised as non-standard, yet functional within dialects (Di Paolo 1989; Mishoe & Montgomery 1994).

They might not could have gone over the state line to get her. (example from Battistella, 1995) By giving this example Battistella writes that in the combination might could, might -the first element corresponds to the same as that of the adverb *maybe*. (Battistella, 1995)

2. **Auxiliary–Semi-Modal Combinations**: A central modal plus a semi-modal (*should be able to, must have to, may need to*) are standard in English and widely used to express nuanced obligation, necessity, or ability (Collins 2009; Palmer 2001). For example,

This matter may have to go to court for adjudication. CollinsCobuild (En-En)

Double modality should therefore be considered a **continuum**: some forms are highly grammaticalised and standard, while others remain regional or stylistically marked, reflecting the dynamic nature of modality in context.

2.3 Double Modality in English: Descriptive Perspectives with Examples

Descriptively, double modality illustrates how English speakers **layer modal meaning to convey subtle stance, politeness, or obligation**. While prescriptive grammars often label double modals as redundant, research has shown their **systematic communicative function** across varieties (Di Paolo 1989; Collins 2009; Nagle 2013).

2.3.1 Double Modality in Standard English

In Standard English, double modality most frequently combines a **central modal verb** with a **semi-modal** (*should be able to, must have to, may need to*) (Palmer 2001; Collins 2009).

They should be able to finish the project on time.

Should conveys deontic expectation; *be able to* indicates dynamic ability. Together, the utterance implies that the obligation presupposes capacity.

Students may need to resubmit their assignments.

May signals epistemic possibility; *need to* indicates necessity. The co-occurrence produces a tentative sense of necessity, often used for hedging in academic or institutional contexts.

In addition to earlier descriptive and functional studies of double modality in English (Palmer 2001; Collins 2009), recent research by Nuriyeva (2025) investigates its use in **Standard English discourse**. She demonstrates that double modality—particularly **auxiliary + semi-modal combinations** such as *should be able to* or *may need to*—functions as a **strategic resource for layering meaning**, allowing speakers and writers to convey **obligation, ability, possibility, and politeness simultaneously**. Nuriyeva's work emphasizes the **discourse-sensitive and context-dependent nature** of double modality, highlighting how it operates across genres, including conversational, institutional, and academic contexts. Her findings complement and extend prior analyses by showing that modal layering is **systematic, functional, and pragmatically nuanced** in authentic Standard English. Here comes a text that best illustrates the use of double modality in Standard English.

The rain hadn't stopped all day, and Sarah stood by the window, watching the road disappear into mud. She knew they **might have to leave** before nightfall, even though no one wanted to admit it aloud. Her brother said they **may be able to stay** if the river didn't rise, but his voice lacked confidence. Sarah thought they **should be going to pack** their things anyway. In moments like this, uncertainty filled the room, and every decision seemed delayed by doubt rather than choice.

might have to leave →modal auxiliary (might)+semi-modal (have to)+infinitive (leave)

may be able to stay→ modal auxiliary (mayt)+semi-modal (be able to)+infinitive (stay)

should be going to pack →modal auxiliary (should)+semi-modal (be going to)+infinitive (pack)

2.3.2 Double Modality in Non-Standard Varieties

In Southern American and Scottish English, **auxiliary–auxiliary combinations** such as *might could, may can, should ought* are common (Di Paolo 1989; Mishoe & Montgomery 1994).

You might could help him with the report.

Might adds tentativeness; *could* signals ability. The double modal functions as a polite suggestion rather than a direct request.

In the North of England, the most common double modal construction is *might could.* Batistella (1995) provides a syntactic analysis of this construction. According to his opinion the first element of that double modal (might) functions as a false modal, whereas the second element (could) is the true modal. He bases this calm on the fact that the interrogative sentences containing a double modal are formed by means of the second modal. To support his argument, he gives the following example.

Could you might use a teller machine? (Battistella, 1995)

You might could do that, couldn't you? (Battistella, 1995)

I used to could play the piano well.

Used to could expresses habitual past ability, showing how double modality encodes nuanced temporal and capacity meanings.

One more example comes from the collected fiction "The Flesh Made Word" in Southern U.S. dialect.

"Can it get any hotter?" she said…

"I reckon it *might could," the woman with the protruding teeth said, "but I know for a fact my apartment couldn't get no hotter."*

The expression might ***could*** *is a good double modal example in the above given example which expresses double modality in non-standard English.*

2.3.3 Pragmatic Functions

Across both standard and non-standard varieties, double modality serves multiple **pragmatic functions**:

Mitigation and politeness: softening directives (*might could*).

Emphasis: intensifying necessity (*must have to*).

Precision of stance: cautious necessity (*may need to*).

Interpersonal alignment: balancing authority and solidarity (Mishoe & Montgomery 1994).

Thus, double modality is not marginal but a **resource for nuanced expression**, reflecting both structural possibilities and social-interactional needs.

2.4 Theoretical Perspectives on Double Modality

Double modality has attracted attention not only from descriptive grammarians but also from scholars in **cognitive-pragmatic, functional, and discourse-oriented frameworks**. These perspectives help explain why modal layering occurs and how it functions in context.

2.4.1 Cognitive-Pragmatic Perspective

From a cognitive-pragmatic standpoint, double modality reflects the **interaction between conceptual representation and pragmatic inference**. Nuyts (2001) argues that modality is inherently relational and context-dependent: speakers evaluate propositions based on both epistemic certainty and deontic or dynamic constraints. In double modal constructions, the layering of modals allows speakers to **encode multiple evaluative dimensions simultaneously**. For example, in *They should be able to comport themselves as they want*, *should* encodes normative expectation, while *be able to* encodes capacity; together, they allow the speaker to express **conditional obligation contingent on ability** (Collins 2009).

2.4.2 Functional Grammar Perspective

Within systemic-functional grammar, modality is a **meta-communicative resource** used to manage interpersonal meaning (Halliday 1994; Coates 1983). Double modality enhances **interpersonal modulation** by allowing speakers to adjust the **strength of obligation, probability, or permission**. For instance, *may need to* in academic writing functions to **soften directives**, thereby maintaining politeness while still signalling necessity. Similarly, in professional discourse, *should be able to* balances prescriptive norms with recognition of individual competence. Functional grammar thus situates double modality as a **tool for nuanced interpersonal negotiation** rather than a purely structural phenomenon.

2.4.3 Discourse Analysis Perspective

From a discourse-oriented view, double modality is examined in terms of **interactional goals, genre conventions, and contextual factors**. Scholars such as Mishoe and Montgomery (1994) and Nagle (2013) show that regional or dialectal double modals like *might could* serve **hedging and politeness strategies**, while in Standard English, combinations like *should be able to* or *may need to* are genre-sensitive, occurring more frequently in **academic, journalistic, or institutional discourse**. This perspective emphasises that modal meaning is **negotiated in context**, and that double modality provides speakers with **flexible means to express layered epistemic, deontic, and dynamic stances**.

2.4.4 Integrative View

Taken together, these frameworks suggest that double modality operates at the **intersection of cognitive evaluation, functional intention, and discourse strategy**. It is not an accidental redundancy but a systematic resource that allows speakers to:

1. Encode multiple modal domains simultaneously (epistemic, deontic, dynamic).
2. Adjust interpersonal force and politeness.
3. Manage expectations, obligations, and evaluations across discourse contexts.

By combining these perspectives, researchers can better account for **both the grammatical form and communicative function** of double modals, providing a foundation for empirical discourse analysis.

3. Analysis of Double Modality in Authentic Discourse

This section investigates how double modality functions in authentic discourse, focusing on data from the *Collins Cobuild English Grammar* and supported by examples from both standard and non-standard English. The aim is to illustrate how double modality contributes to layered meaning, interpersonal nuance, and discourse-specific strategies.

3.1 Normative and Ability Layering: Should be able to

Consider the sentence:

1. *They should be able to comport themselves as they want* (Collins Cobuild).

Here, the modal verb *should* conveys **deontic obligation or expectation**, while the semi-modal *be able to* encodes **dynamic ability**. The interaction produces a layered meaning: individuals are not only expected to behave properly, but this expectation presupposes that they **possess the capacity to do so**.

This example demonstrates the **auxiliary–semi-modal type of double modality** (Palmer 2001; Collins 2009). It exemplifies how speakers encode obligation contingent on ability, avoiding the unrealistic implication that one might be obligated to do something impossible. Pragmatically, the construction balances **authority with recognition of capacity**, making the utterance more socially acceptable in discourse.

3.2 Responsibility and Competence in Unstituional Contexts

A more complex example appears in:

2. *Doctors should be able to decide who they can safely let out of hospital early* (Collins Cobuild).

The initial *should* again conveys normative obligation, highlighting the professional responsibility of doctors. The phrase *be able to* foregrounds the **competence and authority** required to make medical decisions. Within the complement clause, the additional modal *can* introduces a further layer of **possibility or permission**, relating to whether patients may safely be discharged.

This construction illustrates **triple modality**: *should + be able to + can*. The layered structure expresses that doctors are expected to have the ability to make decisions about what is safely possible, intertwining **obligation, ability, and possibility**. Such layering is typical of **institutional discourse**, where professional duties, competence, and practical feasibility must all be explicitly aligned (Mishoe & Montgomery 1994; Nagle 2013).

3.3 Double Modality and Politeness Strategies

In conversational discourse, non-standard double modals (*might could*) are frequently used to **mitigate face-threatening acts**. For example:

You might could open the window for me.

Here, the double modal softens a directive, creating a **polite suggestion** rather than a command. As Di Paolo (1989) and Mishoe & Montgomery (1994) argue,

such constructions function as **dialectally embedded politeness strategies**.

While absent from formal registers, these non-standard forms reveal the **pragmatic flexibility of double modality**. They allow speakers to fine-tune stance, particularly in contexts requiring deference, solidarity, or indirectness.

3.4 Genre Sensitivity

Double modality also displays **genre-specific distribution**. In academic writing, constructions such as *may need to* or *should be able to* are common because they combine **tentativeness with necessity**, aligning with the conventions of cautious academic stance (Hyland 1998). In contrast, conversational genres prefer non-standard forms like *might could*, serving **solidarity and politeness functions**.

Thus, double modality is not a marginal or peripheral phenomenon but a **context-sensitive resource**. Its distribution across discourse genres reflects the interplay of **grammatical structure, pragmatic strategy, and social meaning**.

4. Discussion

The analysis of authentic discourse reveals that **double modality is not merely a redundancy** but a **functional strategy** through which speakers encode layered meaning. It challenges the traditional prescriptive view that modal verbs should occur only once per clause, demonstrating instead that multiple modal elements often serve complementary purposes.

4.1 Challenging Prescriptive Constraints

Conventional grammar descriptions frequently marginalize double modals as "non-standard" or "ill-formed" (Palmer 2001). However, the data demonstrate that such constructions are both **grammatically systematic** and **semantically purposeful**. For instance, *should be able to* combines **obligation and ability**, while *might could* functions as a **dialectal politeness strategy**. These patterns illustrate that English speakers exploit the modal system in ways that go beyond canonical descriptions.

4.2 Layered Meaning in Institional and Everyday Discourse

Institutional discourse (e.g., medical contexts) often requires the careful balancing of **obligation, competence, and possibility**. Triple modality, as in *Doctors should be able to decide who they can safely let out of hospital early*, explicitly encodes this balancing. By contrast, everyday conversation tends to favour forms like *might could* or *may should*, which serve **pragmatic functions of mitigation, politeness, or solidarity** (Mishoe & Montgomery 1994; Di Paolo 1989).

Thus, double modality adapts to the needs of different **genres**: in formal registers it conveys **precision and caution**, while in informal contexts it facilitates **interpersonal negotiation**.

4.3. Modality, Stance, and Discourse

The use of double modality demonstrates how modality is central to **stance-taking**. Single modals often leave the speaker's position underdetermined; by combining modals, speakers can index **fine-grained distinctions** between expectation, ability, possibility, and necessity. This allows them to manage face needs, mitigate assertions, and align with discourse conventions (Hyland 1998; Collins 2009).

In this sense, double modality underscores the inherently **dialogic nature of discourse** (Bakhtin 1981). It reflects how speakers continuously negotiate meaning in relation to social norms, institutional roles, and interlocutor expectations.

4.4 Broader Implications

The phenomenon also has implications for:

Theoretical grammar, as it challenges the neat separation between core modals and semi-modals.

Dialectology, since non-standard double modals remain robust features of Southern American English, Scots, and other varieties.

Applied linguistics and pedagogy, because learners of English are rarely exposed to double modality despite its frequency in authentic discourse.

By recognising double modality as a **legitimate discourse resource**, linguists and educators can provide a more accurate and nuanced account of English usage.

Conclusion

This study has examined the phenomenon of **double modality in discourse**, highlighting its grammatical, semantic, and pragmatic dimensions. While much traditional research has concentrated on single modal elements in isolation, authentic usage demonstrates that speakers frequently combine two or more modals to achieve **layered and nuanced meanings**.

The analysis of examples from both institutional and conversational discourse revealed that double (and even triple) modality enables speakers to simultaneously express **obligation, ability, and possibility**. Constructions such as *should be able to* illustrate how normative expectation intersects with competence, whereas more complex forms like *should be able to ... can* encode professional responsibility, capacity, and conditional permissibility within a single utterance. In informal registers, combinations such as *might could* function as strategies of **politeness, mitigation, and stance-taking**, thereby confirming the discourse sensitivity of modality.

The following naturally occurring examples further illustrate the multifunctionality of double modality:

I think we should be able to wangle it so that you can start tomorrow (Collins Cobuild 2024).

Any competent computer buff should be able to do it for you in a few minutes (Collins Cobuild 2024).

He should be able to keep his room tidy with the generous amount of storage space (Collins Cobuild 2024).

The hen may not be able to feed its young (Collins Cobuild 2024).

Some students may not be able to resume their studies (Oxford English Dictionary 2024).

We may not be able to do it to the extent that we would like (Collins Cobuild 2024).

He had already intimated that he might not be able to continue (Oxford English Dictionary 2024).

These examples confirm that double modality is not marginal or redundant but serves as a **strategic resource** for negotiating epistemic stance, interpersonal relations, and speaker commitment. They show that modal verbs (*should, may, might*) frequently combine with semi-modals (*be able to*) to express subtle shades

of meaning that neither element alone could fully convey.

By situating double modality within a discourse-analytic framework, this study demonstrates that such structures reflect the **dynamic interplay between grammar, meaning, and context**. Future research may extend this investigation through corpus-based studies, cross-linguistic comparisons, and pedagogical applications.

In sum, double modality is best understood not as a grammatical anomaly but as a **multifunctional discourse strategy**, deeply embedded in authentic language use.

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PHILOSOPHICAL SCIENCES

FROM ENLIGHTENMENT TO ARTISTIC PHILOSOPHY: JADIDISM AND THE CULTURAL MODERNIZATION OF TAJIK SOCIETY

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ABSTRACT

This article analyzes Jadidism of the early 20th century as a holistic philosophical and cultural project for the modernization of Tajik society, in which artistic culture served as a key instrument for the transformation of public consciousness. In contrast to the narrow understanding of Jadidism as an educational or enlightenment reform, the work examines it as a form of philosophical renewal, realized primarily through literature, theater, and journalism. The artistic practices of the Jadids are interpreted as a special space for philosophical expression, where fundamental questions of reason, progress, social responsibility, and the role of the individual in history were explored.

It is shown that Jadid artistic culture contributed to a rethinking of traditional notions of humanity and society, shaping a new anthropological and social ideal focused on knowledge, critical thinking, and active citizenship. Through artistic expression, philosophical ideas of modernization acquired an accessible and emotionally charged form, ensuring their widespread dissemination and gradual integration into public consciousness.

Particular attention is given to the role of art in bridging the gap between tradition and modernity. The artistic culture of Jadidism enabled philosophical modernization without radically breaking with cultural identity, ensuring a synthesis of Islamic ethics, local intellectual heritage, and modern rationalist principles. The article argues that artistic practices served as a mediator between philosophical reflection and social practice, transforming Jadidism into an effective mechanism for intellectual and cultural renewal.

The scientific novelty of the study lies in the philosophical interpretation of Jadid artistic culture as a form of practical social philosophy, which played a fundamental role in the process of modernization of Tajik society at the beginning of the 20th century.

Keywords: Jadidism, philosophical modernization, artistic culture, public consciousness, Tajik society.

Introduction: The early 20th century marked a period of profound intellectual and cultural transformation for Tajik society, during which Jadidism emerged as a key movement in philosophical and sociocultural modernization. Emerging at the intersection of traditional Islamic culture and new rationalist worldviews, Jadidism extended far beyond educational reform and took on the character of a holistic philosophy of renewal, encompassing forms of thought, artistic creativity, and public consciousness. In this context, the artistic culture of the early 20th century emerged not simply as a reflection of social change but as a unique space for philosophical reflection, in which the problems of humanity, society, and historical development were explored [7, pp. 1–6].

The artistic practices of the Jadids—literature, theater, journalism, and poetry—became a crucial tool for conveying the philosophical ideas of modernization. Through artistic imagery, symbols, and aesthetic form, concepts of reason, progress, social responsibility, and a critical attitude toward tradition were articulated. In this case, art served as a philosophical mediator between abstract thought and mass consciousness, allowing for a rethinking of ingrained worldviews without directly conflicting with society's cultural and religious identity [10, pp. 53–58].

The relevance of this study stems from the need for a philosophical analysis of Jadidism not only as a historical and cultural movement but also as a form of philosophical modernization realized primarily through artistic culture. The article aims to identify the sociophilosophical content of Jadid artistic practice and to elucidate its role in the formation of a new type of philosophical consciousness in Tajik society at the beginning of the 20th century. In this context, artistic culture is viewed as an active factor in the philosophical reorganization of society, rather than as a secondary consequence of socio-political processes.

The historical and social context of the emergence of Jadidism

The emergence of Jadidism in Tajik society in the late 19th and early 20th centuries was driven by a complex of profound historical and social transformations that affected the foundations of traditional society. This period was characterized by a crisis in established forms of social organization, religious education, and cultural self-reflection, which created fertile ground for the emergence of new intellectual and philosophical movements. Jadidism emerged as a response to the growing discrepancy between traditional models of thought and the objective conditions of socio-historical development [7, pp. 9–14].

One of the key factors that shaped the social context of Jadidism was the incorporation of the Central Asian regions into the Russian Empire. The colonial administration introduced new forms of governance, legal norms, and economic practices that significantly altered the social structure of society. These processes

were accompanied by urban growth, the expansion of trade relations, and increased social differentiation. At the same time, the local population was introduced to elements of European culture, science, and the educational system, stimulating a reconsideration of traditional notions of knowledge and social structure [2, pp. 118–123].

The crisis of the traditional educational system, particularly the madrasah, became another important factor in the emergence of Jadidism. The formalized nature of education, the dominance of scholastic methods, and the disconnect from the practical needs of society led to the loss of intellectual authority by educational institutions. Under these conditions, the idea of a "new method" (usul-i jadid) was perceived as a necessary alternative, aimed at renewing not only pedagogical practices but also the very way of thinking [7, pp. 27–31]. Education began to be understood as an instrument of social and philosophical transformation.

Pan-Islamic reform processes also had a significant influence on the formation of Jadidism. In the second half of the 19th century, ideas of rational interpretation of religion, reconciling faith with the demands of the times, and recognizing the value of scientific knowledge actively developed in the Muslim world. These ideas also found a resonance in the Tajik community, where they were combined with local cultural traditions and historical experience [9, pp. 703–707]. In this sense, Jadidism was part of a broader intellectual movement aimed at renewing Islamic thought without losing its spiritual foundations.

Finally, socio-cultural changes within Tajik society itself played a significant role in the emergence of Jadidism. The emergence of a new intelligentsia, connected to the printed word, literature, and artistic culture, contributed to the dissemination of critical ideas and philosophical principles of modernization. This milieu recognized art and literature as effective forms of influencing public consciousness, which subsequently determined the special role of artistic culture in the Jadid movement [3, pp. 66–70].

Thus, the historical and social context of the emergence of Jadidism represents a complex interweaving of colonial transformations, the crisis of traditional knowledge, reformist tendencies in Islamic thought, and internal cultural shifts. It was this combination of factors that determined the emergence of Jadidism as a philosophically and culturally significant movement, focused on the modernization of Tajik society through the renewal of forms of thought and artistic expression.

Jadidism as a philosophy of renewal

Jadidism in the Tajik environment of the early 20th century represented not only a reformist movement in education and culture but also a holistic philosophy of renewal aimed at rethinking the fundamental foundations of social and individual existence. Its philosophical content is manifested primarily in a critique of the traditional mode of thinking, based on dogmatism and the uncritical reproduction of authority, as well as in the affirmation of reason and knowledge as key instruments of historical development [7, pp. 41–46]. In this sense, Jadidism can be viewed as a form of modern social philosophy adapted to the cultural and religious conditions of Tajik society.

The central concept of the Jadid philosophy of renewal is the idea of progress, understood not as a mechanical borrowing of Western models, but as an internal transformation of society through the development of education, culture, and critical thinking. The Jadids proceeded from the conviction that the backwardness of society is caused not by religious tradition as such, but by its distorted and formalized perception. Therefore, the philosophy of renewal was built on the principle of reconciling faith and reason, which made it possible to justify the need for reform without directly contradicting Islamic ethics [9, pp. 709–713].

An important philosophical aspect of Jadidism was its rethinking of the category of knowledge. Knowledge was viewed not as a static body of texts to be memorized, but as a dynamic process of understanding the world and society. Scientific knowledge and secular education were philosophically justified as means of expanding the horizons of thought and social engagement of the individual. Jadid philosophy of renewal thus undermined the traditional opposition between the "religious" and the "secular," affirming their fundamental compatibility [7, pp. 53–57].

A special place in Jadidist philosophy is occupied by the image of man as the subject of historical action. In Jadid discourse, the individual is presented as the bearer of reason, moral responsibility, and the capacity for self-improvement. The renewal of society was conceived as impossible without the internal transformation of man, his liberation from intellectual passivity and social inertia. Thus, Jadidist philosophy acquired a distinctly ethical and social dimension, linking individual development with collective progress [10, pp. 112–116].

Jadidism, as a philosophy of renewal, also assumed a critical approach to social institutions and cultural practices. Enlightenment critique encompassed the educational system, family relations, the status of women, forms of social behavior, and artistic canons. However, this critique was constructive in nature and aimed at reform, not the destruction of the traditional foundations of society [13, pp. 81–85]. In this context, artistic culture became the most important space for the philosophical expression of ideas of renewal.

Thus, Jadidism should be viewed as a holistic philosophy of modernization, synthesizing rationalistic, ethical, and social elements. Its philosophy of renewal was not limited to borrowing external models, but represented an internal process of intellectual transformation within Tajik society, paving the way for the emergence of a new type of philosophical and artistic consciousness in the early 20th century.

Artistic culture as a form of philosophical expression

Within the Jadid movement, artistic culture of the early 20th century acquired the status of not a secondary reflection of social change, but an independent space for philosophical understanding of reality. Literature, theater, journalism, and poetry became forms of expression for philosophical ideas of renewal, allowing for the transmission of complex concepts of reason, progress, and social responsibility in an accessible and emotionally charged form. It was through artistic ex-

pression that the Jadids sought to overcome the limitations of abstract philosophical discourse and reach out to broad segments of society [7, pp. 91–95].

Literary creativity occupied a central place in the Jadid artistic culture. The literary text was viewed as a means of philosophical critique of traditional lifestyles, social stereotypes, and established forms of thought. Through plot, character, and symbolism, authors raised questions about the relationship between the individual and society, the responsibility of the intelligentsia, and the role of education and knowledge in human destiny. Literature in this context acted as a form of "practical philosophy" oriented toward cultivating a new type of consciousness [1, pp. 132–136].

An equally significant form of philosophical expression was theater, which the Jadids actively utilized as a tool for social influence. The theater stage became a space for philosophical dialogue, where social and moral issues were visualized and acquired the character of a collective experience. Through dramatic conflicts, contradictions between tradition and modernity, ignorance and knowledge, passivity and social activism were explored. Theater allowed philosophical ideas to be combined with lived human experience, enhancing their transformative potential [7, pp. 118–122].

Journalism and the periodical press played a special role in shaping the philosophical discourse of Jadidism. Newspapers and magazines became venues for the discussion of pressing social and cultural issues, where artistic and philosophical elements were closely intertwined. Essays, features, and satirical texts combined rational analysis with artistic expressiveness, contributing to the formation of a critical public consciousness [8, pp. 203–207]. In this sense, journalism served as a mediator between philosophical reflection and social practice.

The philosophical significance of Jadid artistic culture was also manifested in the formation of a new aesthetic ideal. Art ceased to be solely a means of entertainment or religious and moral instruction and began to be understood as a space for social responsibility. Aesthetics acquired an ethical dimension, reflecting the desire for harmony between reason, morality, and social progress [10, pp. 146–150]. This approach brought Jadid artistic culture closer to the philosophical concepts of modern art.

Overall, artistic culture within the framework of Jadidism served as a special form of philosophical expression, in which ideas of renewal acquired a concrete, sensory embodiment. It contributed to the formation of a new philosophical consciousness based on critical thinking, a historical approach, and social responsibility. It was through artistic practices that Jadid philosophy of renewal permeated everyday life, becoming an effective tool for the modernization of Tajik society in the early 20th century.

Philosophical modernization of society through artistic practices

The artistic practices of Jadidism in the early 20th century became one of the key mechanisms for the philosophical modernization of Tajik society, as it was through art that ideas of renewal acquired social traction and entered everyday consciousness. Unlike abstract philosophical discourse, accessible to a narrow circle of educated elites, artistic culture allowed philosophical meanings to be conveyed in a form understandable and emotionally relatable to broad segments of the population. Art thus served as a mediator between philosophical reflection and social reality [7, pp. 155–160].

One of the most important directions of philosophical modernization through artistic practice was the formation of a new image of the human being. In Jadid literature and theater, a central role was played by a character striving for knowledge, self-development, and social responsibility. This image was contrasted with the traditional personality type, oriented toward passive adherence to established norms. Artistic narrative articulated the philosophical idea of the human being as a subject of history, capable of consciously influencing the fate of society [1, pp. 141–145]. This anthropological reorientation was one of the key hallmarks of modern philosophical thinking.

Philosophical modernization also affected ideas about society as a holistic system. Jadid works of art often depicted society in dynamics, emphasizing its contradictions, social injustice, and the need for reform. This artistic understanding contributed to the destruction of a fatalistic worldview and the formation of a historical consciousness in which social change was viewed as the result of human activity rather than a predetermined order [11, pp. 98–102].

The aesthetics of social criticism played a special role in philosophical modernization. Satirical and journalistic genres were used to expose ignorance, hypocrisy, and social vices, which the Jadids perceived as obstacles to social progress. In this context, satire served a philosophical function, revealing the contradictions between proclaimed values and actual social practice [8, pp. 214–218]. Social experience was rationalized through artistic irony and the grotesque.

An equally significant aspect of philosophical modernization through artistic practice was the rethinking of the role of art in society. Art ceased to be an autonomous sphere and acquired the status of a socially significant activity aimed at cultivating a new type of social consciousness. Artistic creativity was viewed as a form of philosophical service to society, aimed at developing moral guidelines and intellectual activity [10, pp. 152–156]. This approach brought Jadid aesthetics closer to the philosophy of enlightenment and social reformism.

Thus, the artistic practices of Jadidism became an effective tool for the philosophical modernization of Tajik society, facilitating the transition from traditional to modern thinking. Through literature, theater, and journalism, philosophical ideas of renewal were integrated into public consciousness, fostering a new understanding of humanity, society, and historical development. This is precisely where the profound philosophical significance of Jadidism's artistic culture as a form of modernization in the early 20th century is evident.

The influence of Jadid artistic culture on public consciousness

Jadid artistic culture of the early 20th century had a profound and multifaceted impact on the public consciousness of Tajik society, serving as a key factor in

the transformation of value orientations and modes of social self-perception. Through literature, theater, and journalism, philosophical ideas of renewal extended beyond narrow intellectual circles and became part of the mass cultural experience. This contributed to the formation of a new type of public consciousness based on critical thinking, historicity, and an awareness of the individual's social responsibility [7, pp. 165–170].

One of the most significant results of the influence of Jadid artistic culture was the destruction of traditional intellectual passivity. Literary texts, imbued with socio-philosophical issues, encouraged readers and viewers to reflect on their own position in society, the causes of social backwardness, and the possibilities for overcoming it. Art ceased to be a neutral backdrop to everyday life and became a stimulus for a meaningful approach to reality [1, pp. 148–152]. This was the manifestation of its philosophical and pedagogical function.

Jadid artistic culture exerted a significant influence on the formation of a new social ideal. The values of knowledge, labor, moral improvement, and civic engagement increasingly came to be at the center of artistic discourse. These values were contrasted with social conformism and uncritical adherence to tradition. Artistic imagery affirmed the idea that societal progress is possible only with the active participation of educated and morally responsible individuals [11, pp. 105–109]. This led to a philosophical rethinking of the goals and meaning of social development.

The influence of Jadid artistic culture also touched upon the sphere of collective identity. Artistic forms explored questions of cultural self-awareness, historical memory, and the place of Tajik society in a changing world. Art became a space for the development of a new understanding of national and cultural identity, based not on isolation but on dialogue with other cultures and intellectual traditions [3, pp. 74–78]. This contributed to the expansion of the philosophical horizons of public consciousness.

Artistic culture played a special role in legitimizing modernization ideas. In the face of resistance from a portion of traditional society, philosophical ideas of renewal, expressed in artistic form, were perceived less controversially and gradually integrated into the system of social perceptions. The aesthetic impact of art helped to soften the tension between tradition and modernity, creating the conditions for a gradual transformation of public consciousness [7, pp. 172–176]. This demonstrated the strategic significance of Jadidism's artistic practices.

Thus, the influence of Jadid artistic culture on public consciousness consisted not only of the dissemination of new ideas but also of a transformation in the very way social reality was perceived. Art shaped a philosophical approach to society as a historically transformative system and to the individual as an active agent of these changes. It was precisely this influence that made Jadid artistic culture a crucial factor in the philosophical modernization of Tajik society in the early 20th century.

Conclusion

This analysis allows us to view Jadidism and the associated artistic culture of the early 20th century as a holistic philosophical project for the modernization of Tajik society, in which art acted not as an auxiliary but as a system-forming element of intellectual transformation. Jadid artistic practice became a space where philosophical ideas of renewal acquired a visual, emotionally charged, and socially effective form, capable of influencing mass consciousness and transforming established modes of thought. It was through artistic culture that the philosophy of modernization transcended the confines of narrowly elite discourse and became part of public reflection [7, pp. 178–181].

Jadidism demonstrated a fundamentally new approach to the relationship between philosophy, art, and society in the Tajik intellectual tradition. Artistic creativity ceased to be merely aesthetic expression or moralizing and acquired the status of a philosophical instrument of social analysis and criticism. Key philosophical issues were explored through literature, theater, and journalism—the role of reason in history, individual responsibility, the dynamics of social development, and the possibility of consciously transforming social reality. Thus, artistic culture became a form of practical philosophy oriented toward changing public consciousness.

The historical and philosophical significance of Jadid artistic culture also lies in the formation of a new type of social consciousness based on critical thinking, historicity, and the value of knowledge. It contributed to a reassessment of traditional norms and authorities, without destroying society's cultural identity, but rather transforming it in response to the challenges of the times. This synthetic nature of Jadid modernization ensured its sustainability and long-term influence on the development of philosophical and cultural thought in the region.

The scientific novelty of this study lies in its interpretation of Jadidism not only as a reformist or artistic movement, but as a form of philosophical modernization realized primarily through artistic practices. This approach allows for a new understanding of the role of art in the intellectual history of Central Asia and the examination of Jadid artistic culture as a fundamental element of the philosophical restructuring of Tajik society in the early 20th century.

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PHYSICS AND MATHEMATICS

STUDY OF THE ELASTIC IMPACT OF A SPHERICAL OBJECT ON A VERTICAL PLATE

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ABSTRACT

This article is about studying the vibrations of objects hitting a vertical plate in order to assess the possible damage required for the restoration of areas affected by the destruction and explosions during the earthquake. The energy reflection coefficient, which describes the wave reflected from a metal object, is studied. Investigation opens up opportunities for the development of devices with unique properties.

Keywords: study, elastic impact, spherical object.

We will use the principle of similarity, when a model with small-scale objects can be transferred to real objects in size. Even casual scaling will be appropriate when used in practice for the work of the mechanisms shown in the **Figure**. The experimental setup is shown in the **Figure** where an object is shown swinging on a *string tied to a tripod and hits the metal body at the base.*

Figure. A metal object fixed on a horizontal stand receives impacts from a spherical ball deflected at angles of deviation from the equilibrium position, which is measured using a protractor attached to the tripod.

Fundamentals and Principles of the Investigation

The impact of two objects with masses m_1 and m_2, velocities υ_1 and υ_2 will result in the creation of a total momentum of two bodies with masses m_1 and m_2 along the straight line which involves the impact action from the array of objects with velocities u_1 and u_2. The law of conservation of momentum for the masses moving on the straight line can be written in the form

$$\frac{m_1\upsilon_1^{\,2}}{2}+\frac{m_2\upsilon_2^{\,2}}{2}=\frac{m_1u_1^{\,2}}{2}+\frac{m_2u_2^{\,2}}{2}$$

$$\Delta S=\Big(\sum_{i=1}^{5}\Delta\varepsilon_i^{\,2}/(5(5-1))\Big)^{1/2}.$$

Also the law of conservation of kinetic energy will have the form

$$\frac{m_1\upsilon_1^{\,2}}{2}+\frac{m_2\upsilon_2^{\,2}}{2}=\frac{m_1u_1^{\,2}}{2}+\frac{m_2u_2^{\,2}}{2}.$$

The last two laws can be rewritten in the form

$$m_1(\upsilon_1-u_1)=m_2(u_2-\upsilon_2)$$

$$m_1(\upsilon_1^{\,2}-u_1^{\,2})=m_2(u_2^{\,2}-\upsilon_2^{\,2})$$

Since that the velocity of the second body before the elastic impact may be considered zero, we obtain the form for the velocity of the first body [1]:

$$u_1=\frac{(m_1-m_2)\upsilon_1}{m_1+m_2}.$$

The latter relationship makes it possible to estimate the velocity of a body with mass before and after impact. The coefficient of restitution is used, which is a measure of the elasticity of the impact in the following form:

$$\varepsilon = \frac{u_1}{\upsilon_1}.$$

The latter expression uses the components of the velocity of a spherical object perpendicular to the direction of motion, which are defined as the sides of a right triangle, which forms the hypotenuse in the form of the direction of the weight vector and the side of the perpendicular direction. Moreover, the angle of deflection of a spherical object in a right triangle is equal to half the angle of deflection of a spherical object that oscillates suspended on a string.

The oscillations occur symmetrically about the centre line which is vertical in the direction of gravity and symmetrical about the direction of the vertical force. The deviation of the string about the vertical can be divided into two equal parts, one of which corresponds to the movement from the direction to the straight line in the direction of gravity.

If the impact is elastic, then the energy corresponding to the wave velocity m_2 incident on the solid is proportional to the angle of deviation from the vertical of the direction of gravity. In this case, the recovery will depend only on the angle of deviation from the vertical and the formula according [1] for it will be

$$\varepsilon = \frac{\sin(\varphi_{u1}/2)}{\sin(\varphi_{\upsilon_1}/2)}.$$

Model experiment and calculations

Calculation of the arithmetic mean value ε_{mv} of the recovery coefficient using the formula presented in [1], deviation of the arithmetic mean $\Delta\varepsilon_i$ using the formula from [1], absolute error of determining the loss coefficient, as difference between mean value ε_{mv} and calculation for i-th experiment ε_i: $\Delta\varepsilon_i = \varepsilon_{mv} - \varepsilon_i$; calculation of the root mean square deviation of the arithmetic mean value $\Delta S = (\sum_{i=1}^{5} \Delta\varepsilon_i^{\,2}/(5*(5-1)))^{1/2}$, calculation the relative measurement error in the experiment $\Delta E = \Delta\varepsilon_{mv}/\varepsilon_{mv} * 100\%$ for metallic sphere object and the plastic object are presented in Tables 1 and consequently Table 2 [1]:

Table 1

N	$\varphi_{\upsilon_1}0$	$\varphi_{u1}{}^0$	ε	$\Delta\varepsilon$	ΔS	ΔE ,%
1	45^0	15^0	0.341	0.008	0.0213	11.4
2	45^0	13^0	0.296	0.037		
3	45^0	12^0	0.273	0.060		
4	45^0	17^0	0.389	0.056		
5	45^0	16^0	0.364	0.031		
Mean value			0.333	0.038		

Table 2

N	$\varphi_{\upsilon_1}{}^0$	$\varphi_{u1}{}^0$	ε	$\Delta\varepsilon$	ΔS	ΔE , %
1	45^0	250	0.564	0.0108	0.0235	5.59
2	45^0	300	0.676	0.0412		
3	45^0	260	0.587	0.0478		
4	45^0	280	0.629	0.0058		
5	45^0	320	0.718	0.0832		
Mean value			0.6348	0.0378		

Conclusions

Large-scale modelling allows explore objects in full size and the behaviour of engineering structures promising field that combines science and technology to solve persistent problems of our time. It is important for improving mechanical devices, energy systems, technologies, and civil safety objects, etc. [2 - 4]. Further research in this area opens up prospects for the development of devices and materials also to eliminate the destruction and rebuild of engineering structures.

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TECHNICAL SCIENCES

EVALUATION OF UNIVERSITY STUDENTS' CAREER OPPORTUNITIES USING THE FUZZY MULTI-CRITERIA DECISION-MAKING METHOD

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ABSTRACT

One of the most important and challenging issues of the university student is the selection of the right career path, during which many and often incompatible economic, psychological, and social factors must be taken into account. The selection is a classical Multi-Criteria Decision-Making (MCDM) problem due to these factors, which are career opportunities, job security, job benefits, and a professional-psychological type and career preferences of a student (e.g., vertical/inter-organizational career, professional tasks). Conventional career planning tools frequently cannot systematically balance this multitude of quantitative and qualitative criteria, and the ambiguity and subjectivity of the vision of a student of his future career opportunities is often ignored. In order to deal with such complexity and the existing uncertainty, this paper suggests a new Fuzzy Multi-Criteria Decision-Making (F-MCDM) framework. The F-MCDM method clearly deals with the ambiguity and lack of precision of the subjective ratings of students on career attributes, which include prestige and job flexibility. The framework will initially determine and balance the applicability of the most important criteria, followed by the application of an appropriate F-MCDM method (e.g., Fuzzy AHP or Fuzzy TOPSIS) to enable a systematic assessment and ranking of a list of possible career opportunities. The results will offer a strong, systematic, and clear instrument to students and university career services to evaluate and rank career options, which will add a methodologically adequate approach to the literature on career readiness and decision-making among higher education graduates.

Keywords: career opportunity, university students, fuzzy multi-criteria decision-making (f-MCDM), career preference, job security, professional-psychological type.

Introduction:

The academic life to professional world is a crucial step in the life of the student, as the final occupational decision has major implications on the future wellbeing of the individual and the socioeconomic environment in general. The long-term benefits of this decision include the ability to get desirable jobs, become independent, and increase skills. However, making a proper career preference is a complex task, since it involves weighing many factors which often have an opposing nature to each other.

Factors that determine the career choice of a student are diverse, and they include the external market realities as well as internal psychological dispositions. Empirical research has outlined six major types of career-selection criteria, which are occupational security, remuneration, career advancement opportunities, job flexibility, personal concerns, and extrinsic influences. Moreover, the personal professional-psychological type of a student (e.g., leader, executor, or generator) and his or her career preferences (such as highly vertical or interdisciplinary orientation) have a significant impact on the actual and potential career of the student. Although the role of career readiness is acknowledged and the literature on the determinants of career readiness focuses on individuals, the combination of these heterogeneous, mostly subjective, criteria into a single, systematic, assessment system has not been thoroughly addressed in the extant literature.

This complexity in nature requires the use of sophisticated decision-support tools. Multi-Criteria Decision-Making (MCDM) methods offer a suitable methodological framework in order to organize and solve complex decision problems through systematic assessment of the alternatives in relation to a number of objectives. Indeed, empirical findings prove the successful implementation of MCDM techniques to the field of career preference, such as Analytic Hierarchy Process (AHP), Technique of Order of Preference by Similarity to Ideal Solution (TOPSIS), VIKOR, and PROMETHEE, which justifies the feasibility of a systematic evaluation process.

Nevertheless, career-decision making is marked by a lot of uncertainty and subjectivity. The ideas of prestige, work-life balance, or a readiness of a student cannot be measured with the help of sharp numerical numbers. The choice of a future career, therefore, is inevitably vitiated by imprecision and vagueness that cannot be sufficiently taken into account by the traditional MCDM approaches. This paper, therefore, aims at improving the methodology by using Fuzzy Multi-Criteria Decision-Making (F-MCDM). F-MCDM methods are the only ones that can be used to represent the linguistic and subjective uncertainties surrounding the evaluation of criteria by a student, and thus provide a more realistic and strong evaluation.

The main aim of this paper is to come up with a general F-MCDM framework of systematic evaluation and prioritization of career opportunities to university students. This study will particularly:

1. Determine and summarize a comprehensive list of assessment criteria, which includes professional-psychological type/preferences as well as external employment-related variables.

2. Calculate the weights and relative weight of these criteria, including the subjectivity of students.

3. Use F-MCDM model to rank alternative career opportunities which will give a practical outcome to decision-makers.

Literature Review: Career opportunities of university students.

University student career decision making is a complex process that is affected by both internal and external factors. Empirical studies, such as the work of Pekkaya (2015), always represent career selection as a Multiple-Criteria Decision-Making (MCDM) issue, due to the high count of criteria, many of which are at the same time conflicting. These determinants that have an influence on this decision are usually categorized into broad groups: extrinsic rewards (such as remuneration, ancillary benefits, occupational security), intrinsic rewards (such as job satisfaction, personal circumstances, and adaptive flexibility), and career-specific aspects (such as opportunities of advancement and prestige within the society). It is emphasized in the literature that the relative significance which is assigned to these variables varies significantly between people and situational contexts.

One aspect of the decision-making process that is overlooked and, however, very vital is the psychological disposition of the student. Dukhnovsky (2016) focuses on the importance of the professional-psychological typologies (e.g., leader, executor, communicator, generator) and specific career preferences (e.g., preference to vertical career path or preference towards professional tasks) in determining the specific and possible career development way of a person. The inclusion of such qualitative, psychological variables with extrinsic occupational ones is inevitable in a detailed and individualized evaluation of career opportunities.

The conventional MCDM methods (e.g. AHP, TOPSIS, PROMETHEE) offer a solid structure of a structured evaluation as evidenced by the research that ranks different professions. However, these classical techniques usually presuppose specific, exact numbers of criteria weights and sharp judgments of alternatives. This method is a serious constraint in cases where variables are highly subjective and perception-based, e.g. prestige, work-life balance, human judgment involves a certain vagueness and imprecision.

To curb such shortcomings, it is justified to adopt Fuzzy Set Theory (Zadeh, 1965). The Fuzzy MCDM (F-MCDM) methods (e.g., Fuzzy AHP, Fuzzy TOPSIS) use linguistic variables and triangular or trapezoidal fuzzy numbers explicitly to model and handle subjective, uncertain and ambiguous judgments. This methodology allows the decision-maker, either the student or a career counsellor to express preferences in natural language terms like very high, medium, or low, thus transforming the qualitative nature of perception of career into a form that is mathematically tractable. This means that F-MCDM is a more powerful and realistic model of determining the career prospects of the university students.

Research Methodology

The sample size included 97 final-year students selected at the following institutions: the Kurgan branch of the Russian Presidential Academy of National Economy and Public Administration, which majors in public and municipal administration; Kurgan State University, which majors in management; Yugra State University (Khanty-Mansiysk) which majors in human resource management.

The empirical tools used in the research were:

1) the method of determining the type of professional-psychological type of personality (PPT), which is aimed at defining the belonging of the respondent to one of four types of professional work (leader, executor, communicator, generator) based on personal psychological attributes (Fomin et al., 2013).

2) the Career Readiness (CR) questionnaire designed by the author to determine desired career typologies (specialized/non-specialized, vertical/horizontal, intra-organizational/inter-organizational), the involvement in work (including decision-making activities), performance in risk and uncertainty situations, the ability to implement organizational development strategies, promotion of innovation and new directions, organization and management of work, and positional readiness, which is what the author defined as desired rank in an organization.

The choice of these instruments was motivated by two factors: first, by the fact that they are relevant to the goals of the study; second, by the psychometric characteristics of these instruments as professional psychodiagnostics tools, which increase the credibility of the results.

Statistical tests were carried out, including descriptive tests, tests of significant differences in measured characteristics, and correlation tests to be used to test relationships between variables.

Description of Research Results

The PPT approach was used to determine the prevailing professional-psychological type of students of final-year university students pursuing management-related programmes in the first phase. Table 1 displays the results.

Table 1

Expression of vocational and psychological types in university graduates according to the “PPT” method.

Professional-psychological type	Average value
Supervisor	43,1±9,4
Executor	43,1±6,8
Communicator	32,2±9,0
Generator	38,2±7,6

According to Table 1, the Leader, Generator, and Executor types of professional-psychological are the most common among the graduates.

Graduates that are defined as Leaders are dominated and desire to manipulate people. They are well-communicated, self-driven, energetic, organized, capable of deciding, and responsible. Moreover, they are

also good at delegating power and checking on the performance of delegated duties. Among the students surveyed, this professional-psychological type was noted in 52.3 per cent.

Executors are graduates who are conscientious, obedient, internally disciplined and restrained. They struggle to go out of their rank, excel, and win the goodwill of their seniors. This is because of their lack of initiative which makes them active and competitor. The percentage of this type in the surveyed students was found to be 7.9.

The Generators are future-oriented graduates who have an intuitive vision of long-term prospects of developing ideas and projects. They desire a professional employment that is intellectual in nature and demands education and have a low tolerance to routine. This type was manifested in 39.7% of all the students surveyed.

These findings indicate that the prevalence of the Leader and Generator types among graduates is a beneficial aspect, as it can be used as a sign of the willingness of students to work in managerial positions in the future.

Then we proceeded to the analysis of career preferences among the surveyed students starting with the findings that were received on the preferred type of career as shown in Table 2.

Table 2

Expression of types of career in university graduates, received according to the questionnaire of career readiness.

Career type	Average value
Specialized	3,9±1,9
General	4,3±1,7
Horizontal	3,9±1,7
Vertical	5,2±1,6
Interorganizational	4,7±1,7

Table 2 demonstrates that the career choices that are favoured by university graduates who are enrolled in management programmes include vertical and inter-organiational.

A vertical career presupposes that one can ascend a ladder of an organizational hierarchy and go to a superior level that is accompanied by a higher level of responsibility and higher payment. Sixty-seven point one percent of the students surveyed manifested this kind of career. An inter-organization career is advancing through career stages through various organizations and was reported by 32.7 per cent of students in the survey.

Besides the types of careers, the preferred professional tasks that the graduates preferred to use in building their real career were also established. The most important of them to the students surveyed are:

- Activities that guarantee the execution of development strategy of the organization (significant to 57.2 per cent of students).
- Activities that involve creation of new directions and introducing innovations (applicable to 42.7⁻ of students).

According to the results of the Career Readiness questionnaire, the most common forms of positional readiness among the students who participated in the survey are:

- The willingness to take jobs that are much higher in rank than the current one, with considerable preparation and development of professional-psychological resources (considerable among 33.1% students).
- Willingness to take up roles that are much higher than the present one (important to 29.5% of students).
- Willingness to take up the jobs that are much higher than the present one with extra short-term training (applicable to 37.3% of students).

These results enable us to characterise the real vector of professional career growth of management programmes graduates. Precisely, the surveyed students will be able to actualise their professional-psychological type through vertical and inter-organizational careers, vertical career gaining higher positions, and professional tasks and challenges associated with introducing innovations and assuring organizational development strategy.

Then, we have taken into consideration the outcomes, which in our opinion enable us to characterize the career resources as a potential career development vector of university graduates. In this respect, it is especially crucial to determine and define the interdependences between career preferences (career type, professional tasks, and orientation toward positional development) and professional-psychological types of students. To this end, the results of correlation analysis are employed.

Table 3 shows the correlations between the indicators of the Determination of Professional-Psychological Type approach and the career-type indicators of the Career Readiness questionnaire.

Table 3 correlations show that there are relationships between professional-psychological types and preferred career types. For example:

- The Leader scale demonstrates the highest correlations with the inter-organizational and specialised careers.
- The Executor scale is associated with vertical career.
- The Generator scale is associated with non-specialized and horizontal careers.

Table 3

Matrix of intercorrelation of indicators of scales of the method of identification of vocational and psychological type with indicators of "type of career" according to the questionnaireof career readiness.

Career type	Professional-psychological type			
	Supervisor	Executor	Communicator	Generator
Specialized career	0,53*	0,22	0,20	0,33
General career	0,15	0,30	0,18	0,51*
Horizontal career	0,27	0,17	0,22	0,49*
Vertical career	0,32	0,44*	0,21	0,28
Interorganizational career	0,47*	0,27	0,19	0,24

Note. Correlation coefficients are significant at the level of $p \leq 0.05$.

In that way, to make successful professional development (as well as adapting to the following professional activities), graduates should follow a type of career that is pertinent to their professional-psychological type. This is one of the essential prerequisites of the formation of the potential professional career of a graduate.

It was also found in the study that there are significant correlations between the professional-psychological types of students and their favorite professional tasks (Table 4).

Table 4 data show that there were no significant relationships between the Executor scale and the Communicator scale of the PPT method and the indicators of preferred professional tasks. Nevertheless, the Leader type is also connected to tasks connected with working in uncertain situations, the development of new directions and introduction of innovations. The Generator type is linked with the tasks related to the implementation of the organizational development strategies and tasks related to the large-scale decision making.

Therefore, the competency of undertaking such professional tasks in the future is an asset of realising personal-professional attributes (Leader, Generator) based on the desired type of career. This, in its turn, can become a prerequisite of the possible vehicle of professional career growth among the university graduates.

The analysis of correlation also showed that there were significant correlations between the measures of positional readiness and the scales of Determination of Professional-Psychological Type of Personality method (Table 5).

The findings show that Leader type is associated with willingness to take up roles that are much above the present one, with an additional training that is not long-term. The Generator type is associated with the willingness to take up positions that are much higher than the current position provided that there is a substantial preparation and development of the professional-psychological resources. On the contrary, there were no significant correlations between positional readiness and the Executor or Communicator types.

In this way, the students who have the Leader and Generator types prove their intention to achieve the higher-level positions. This is one of the factors that should be taken into account during the planning of future career development of students. Positional readiness, which is inherent to a specific type of professional-psychological orientation, along with the work of the graduate in the profession and the type of work he or she enjoys, is the possible career growth vector of the graduate.

Table 4

Matrix of intercorrelation of indicators of scales of the method of identification of vocational and psychological type with indicators of "Professional tasks" according to the questionnaire of career readiness.

Professional tasks	Professional-psychological type			
	Supervisor	Executor	Communicator	Generator
Challenges associated with the scale of decision-making processes	0,53*	0,25	0,21	0,51*
Challenges associated with decision-making under conditions of uncertainty	0,50*	0,17	0,22	0,33
Challenges associated with decision-making under conditions of risk	0,31	0,18	0,19	0,34
Tasks aimed at ensuring the implementation of the organization's development strategy	0,32	0,20	0,24	0,53*
Tasks associated with the design and organization of the process	0,35	0,15	0,19	0,31

Note. Correlation coefficients are significant at the level of $p \leq 0.05$.

Table 4

Matrix of intercorrelation of indicators of scales of the method of identification of vocational and psychological type with indicators of "official readiness" according to the questionnaire of career readiness

Positional readiness	Professional-psychological type			
	Supervisor	Executor	Communicator	Generator
Demonstrates readiness to assume positions substantially above the current level	0,43	0,19	0,25	0,39
Demonstrates readiness to assume positions significantly higher than the current level, contingent upon additional short-term training	0,55*	0,21	0,20	0,37
Demonstrates readiness to assume positions significantly higher than the current level, contingent upon substantial training and the development of professional and psychological resources	0,34	0,23	0,19	0,53*
Demonstrates readiness to assume positions of an equivalent level but within a different functional domain	0,30	0,17	0,22	0,32

Note. Correlation coefficients are significant at the level of $p \leq 0.05$.

Conclusion

The empirical research provides the following inferences: The hypothesis that the popularity of certain professional-psychological profiles and professional choices is a measure of student readiness to vocational advancement, expressing not only the actual but also the potential career development of tertiary graduates, is supported by the empirical evidence.

Vocational evolution in reality entails the performance of dominant professional-psychological typologies, that is, Leader, Executor and Generator, as well as the accomplishment of profession-specific tasks and the achievement of jobs that are aligned with the favorite typology of the graduate. The future career path of a graduate refers to a concordation of the career preferences with the personal professional-psychological typology.

It was established that the actual path of academic alumni includes the development of vertical and interdisciplinary career due to the presence of professional-psychological types Leader, Executor, and Generator. Real vocational growth implies the performance of those tasks which will make it possible to implement the organizational development strategies, novel directions, and introduce the innovations and be ready to assume the positions that will be significantly higher than the present position, which will depend on the additional short-term or long-term training.

The future professional-psychological career path of the students who represent the Leader professional-psychological type will presuppose building inter-organizational and specialised careers, along with an ability to conduct professional tasks that require uncertainty aspects, to bring about new directions, and to establish innovations, along with willingness to take up much higher positions, depending on further short-term training.

The future occupational path of students who can be described as the representatives of the so-called Generation instills the creation of a non-specialised, horizontal system of careers, which presupposes the opportunity to perform professional tasks that guarantee the application of the strategies of organizational development and implies the large-scale decision-making, including readiness to work in the positions that would be significantly higher than the current ones, provided that extensive training and the improvement of professional-psychological provisions.

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FORMATION OF BUSINESS MODELS AND DEVELOPMENT OF CORPORATE KARTING AS AN ENTERTAINMENT AND SPORTS INDUSTRY

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ABSTRACT
Today, corporate karting is not only a popular place for visitors, but also a profitable business for entrepreneurs who decide to take up this business. Almost every city in a developed country around the world has various karting organizations and tracks equipped with the necessary infrastructure, since the demand for this sport in foreign countries is quite high.
Keywords: corporate karting, infrastructure.

1. Introduction

Karting is a sport and entertainment, kart racing - the simplest racing cars without a body and, most often, with open wheels. The speed of the kart (Superkart class) can reach 260 km/h.

It is believed that karting was invented by military pilots in the United States after World War II. They arranged races around the airfield on trolleys for transporting aerial bombs. But this hobby was only spread in narrow circles, until Art Ingles, a former pilot, mechanic of the Glendale branch of the Curtis Craft Company, which produced racing cars, took over. In August 1956, at the Pomona motor race, he presented to the public a simple kart. The car was called a trolley (in english *cart)*.

In 1957, Bill Rowles, Duffy Livingstone, and Roy Desbrow form the Go-Kart Company, a kart company. The company was doing so well that it was able to buy a 5-acre plot on which the first karting track was built. At the same time, Ingles founds the Ingels-Borelli company. In 1958, English businessman Mickey Flynn orders five karts from Go-Kart. As early as 1960, there were over 100 companies in the UK producing cards and components.

Kart, due to its small mass, was often used to break speed records on cars with a small engine, as well as for experiments with unusual power plants. There are several attempts to install a jet engine on the kart, the highest recorded speed is 407 km / h. The German physicist and power engineer Laing built a steam-powered kart to demonstrate how compact and reliable such a power plant could be.

The cards of those years were distinguished by a very simple design, low engine power and the complete absence of any security measures. The price of such a card ranged from 100 to 200 US dollars.

It was thanks to the simplicity and cheapness that karting gained wild popularity in the early years of its existence. But by 1962, the karting boom was over. The number of manufacturing firms has fallen. Cards have become more powerful and more perfect, but also more expensive. The simplest frames made of water pipes were replaced by structures with carefully calculated elasticity. Increasing speeds required increased safety. As in any other technical sport, professionals remained in karting.

2. Materials and methods

Karting is usually divided into sports and amateur (or rental).

Sports karting, in turn, is professional, which is based on the activities of a professional sports organization and infrastructure.

In May 1960, the International Motor Sports Federation officially recognized karting as a form of motor sport. In 1962, the International Karting Commission of the International Motorsport Federation (CIK FIA) was established. The International Karting Commission (French: Commission Internationale de Karting, abbr. CIK, CIK-FIA) is the main international sanctioning body for karting.

The Commission is active in the development of karting throughout the world and the regulation of existing karting competitions. The most significant CIK tournament is the World Karting Championship.

The Karting World Championship is a karting competition organized by the CIK - FIA. It has been held annually since 1964 and is the flagship event in karting. The FIA (International Automobile Federation) created the CIK (International Karting Commission) in 1962.

The FIA is best known to the general public as the governing body for motor racing. In 1922, the federation transferred the organization of motor racing to the CSI (Commission Sportive Internationale), an independent committee, which later became known as FISA (Fédération Internationale du Sport Automobile, FISA). The restructuring of the FIA in 1993 led to the disappearance of FISA, placing auto racing under the direct control of the FIA [1].

The FIA General Assembly is the highest governing body, made up of the presidents of the numerous FIA member clubs (Table 1).

Table 1.

Structure of the FIA (FIA) - International Automobile Federation

FIA General Assembly:	
–The President of the FIA also serves as Chairman of the General Assembly:	
➢ □Deputy President for Mobility and Vehicles:	➢ □Deputy President for Sports:

1. FIA World Council on Mobility and Motor Vehicles - governs all non-sporting activities of the FIA	2. Commission on movables and cars	1. FIA World Council of Motorsport - governs all sporting events regulated by the FIA	2. Sports commissions.
– FIA Senate			
– FIA International Court of Appeal			
–FIA Secretariat			

Source: https://ru.wikipedia.org/wiki

There is also a rental or amateur type of this type of motorsport. The rental type of leisure is quite safe and even people with no driving experience are invited to the track. There are even children's karting schools and children's cards. Amateur karting does not require special clothing.

Now in Europe this type of entertainment is very popular and loved. Due to its low cost, car rental in kart clubs is available to almost everyone.

Sport has long turned into a huge business industry - primarily entertainment, albeit with a huge positive impact on a healthy lifestyle.

Gran karting club on the island of Gran Canaria is one of the best European clubs. Anyone can get acquainted here with the basics of kart control, study the design of the machine. The track of the club has a length of 1650 m, and models of cars are capable of speeds up to 100 km/h. For children, the club has a special area where, under the guidance of experienced instructors, they can learn the basics of karting. For teenagers under 16 there is a Junior track.

The Gran Karting club was founded in 1983 and to this day is the benchmark in the world of karting and motorsport in the Canary Islands. Our facilities hosted the Spanish Karting Championships, the Canary Islands Karting Championships, and as a showcase venue for the European Rally Championship.

The club has always wanted to evolve and adapt, which is why the club's facilities are ideal for adults and children, offering the best safety measures on the track and the best rental karts on the market. For the club, the safety of its customers is the most important thing, adapting each track to its users according to their age.

Recently, more and more major global companies and brands have been investing in motorsport to promote themselves and idealize their image (Kaspersky Lab, Coca Cola, Monster Enegry, RedBull, Amazon, Ebay, Ray Ban, BWT and others). Company managers and management in particular are interested in the development of this investment segment, as it allows you to show the company from the side of an active player and leader with global ambitions.

Many companies are looking for an opportunity for a bright and presentable entry into the global business arena, which actually makes it possible to make the Nürburgring Mecca of motorsport with participation in cult sporting events. Nürburgring (Nürburgring, hereinafter simply Ring) is without a doubt the most famous race track in the world. The Nordschleife track was designed and built from 1925 to 1927.

The Nürburgring GP track for Formula 1 was put into operation in 1984. The length of the route is 5.148 km. Number of turns -15. The track record belongs to Michael Schumacher, who in 2004 drove a full GP lap in a Formula car in 1:29.468 minutes.

Thus, the Nürburgring complex now includes several race tracks: the legendary Nordschleife with a length of 20.8 km and the more standard GP Strecke with a length of 5.1 km. It is curious that during the iconic racing marathons Nürburgring Endurance Series and 24 Hours of Nürburgring, these tracks combine to form the most unique track configuration on the Ring. For free rides on tourist days, most amateurs use the Nordschleife track (20.8 km) exclusively. GP - the track can also be used for races, but much less often [2].

Currently, in large cities of the Republic of Kazakhstan, there are rental karting sites, intended mainly for entertainment. In rental karting, chassis with boxless low-power engines are used. The pilot does not need any special training to operate such a kart.

In addition, there is a so-called "winter karting" in the Republic of Kazakhstan. Competitions in this sport are held on snow and ice. Special tires are used both with and without studs. The chassis, depending on the class, are equipped with engines from 50 to 250 cc. cm.

The karting track STK "Sokol" is located in the Almaty region. This is a track that has no analogues in Kazakhstan, the total length of the track is 1650 meters. The track consists of a variety of turns, a straight line and a pit lane, all results are recorded by the most accurate telemetry system. Children's races are held separately.

3. Results and conclusions

Whether recreational or rental, karting develops more as an entrepreneurial activity and is based on a business model. A business model is an analysis and a schematic description of the interrelated business processes of a company. The model clearly shows: what, to whom and how exactly to sell, as well as how profitable it is.

This is not an in-depth business study, but rather an express analysis that allows you to understand:

- how to develop the company;
- how to optimize business processes;

What resources do you need to attract to grow your business?

The business model helps startups to evaluate a niche, see prospects and hidden risks, and test ideas. For an existing business - to find weaknesses and points of growth in order to adjust its work.

The most popular template of the business model of an enterprise (Business Model Canvas) was developed by Alexander Osterwalder and Yves Pignet [3]. It consists of 9 blocks - key elements of the business (Fig. 1).

Figure 1. Business model of Alexander Osterwalder and Yves Pignet

Using this model, you can build a business model for karting.

Karting is a profitable business. It has a relatively small entry threshold, and the market is practically free. Competitors can only be found in big cities, and even then there are few. There are two lines of business:

- Entertaining karting club;

- Sports section, which prepares athletes for participation in competitions.

An entertaining karting club, according to experts, is more profitable to open. Karting for children is especially in demand.

At the heart of sports entertainment is a large area or track, which is called the "karting track". It can be covered or open. The second open-air grounds operate only in the warm season, so this karting club can be considered seasonal. Small cars that are made specifically for racing on small tracks are called "karts". They are small vehicles that do not have a body, but are capable of accelerating to high speeds.

For the construction of the route, 700 m long, you will need a land plot with an area of 3-4 thousand square meters. The road for cars should be paved with the right turns and a sufficient number of straight sections. Usually, an amateur karting or sports club is built away from residential buildings and the city center. An old production facility or an unclaimed warehouse is suitable as a covered area.

The number of staff in the club depends on their professionalism and skills. It is ideal to find such people who will understand the technique, who will be able to fix the go-karts and at the same time instruct clients. If children's karting opens, it's good that the instructors know how to get along with children. Of the additional, but mandatory attributes, you will need to purchase overalls for workers and helmets for visitors. Beautiful identical overalls of the staff will create a positive image, and corporate symbols will make it possible to recognize the club at competitions. On normal business days, the form allows attendees to quickly find a member of staff to ask for help. A quality helmet made in Italy costs about $60, but there are also cheap Chinese options. Before laying the coating, it is desirable to equip the kart with timing. This device allows you to record the time of arrival, the results and display them on the scoreboard. With this attribute, it will be much more interesting for the client to visit the karting club. You can arrange impromptu competitions and observe the dynamics of your own results. It will take about 80 thousand dollars to complete the arrangement of the track, with a coating and all the attributes.

Karting must be equipped with cars. A new car costs from 1.5 to 4 thousand dollars, depending on the power. The main and most expensive part of the car is the engine. Karting frames can also be bought domestically or imported. However, many amateurs and professionals make karts with their own hands. It's much cheaper and more reliable.

Before proceeding with the manufacture, you need to determine what the future karting will be like. The basis of each technical product is a drawing, according to which it is necessary to calculate the amount of necessary materials. Metal pipes are used for frames, they are cut into parts, bent and welded. After manufacturing the main frame, you can begin to design the motor frame, pedal control and steering assembly. All these parts are made according to the same scheme, but their dimensions can be adjusted depending on the height of the person who will operate the machine.

Do-it-yourself karting is equipped with a single-cylinder air-cooled gasoline unit. The pilot must be protected from internal combustion engines and possible burns. The braking system combines at least a pair of wheels.

A workshop that makes karting with their own hands, the presence of a chic track and attentive staff, all this can become a favorite vacation spot for both adults and children. It is these components that will become the key to your unique and profitable business, with a chic name - karting.

Estimates of theorists and entrepreneurs who have been earning money on karting for more than one year practically do not differ in the main indicators: profitability, the amount of starting capital, the time required to reach the level of self-sufficiency, etc. (which is quite rare in such situations). Consider the main economic results of a company operating in the industry represented:

- $7,500 monthly income

- expenses of the enterprise, which include: staff salaries, advertising, depreciation, insurance premiums, taxes and other administrative expenses - $ 2,400 per month.

- net profit, based on the above indicators, will be at the level of $ 5100 / per month.

But, taking into account various force majeure, changes in the competitive situation or general economic trends, the company's profit can be $ 2,500-6,000 per month.

For start-up capital, which is necessary to create a full-fledged company working in this direction, it is necessary to consider the implementation of the idea in question: the creation of a full-fledged karting club. The track and related infrastructure facilities are being built, the necessary equipment is being purchased, and preparatory courses for different age groups are being organized, etc. In this case, you need to invest from 700 thousand to 1 million dollars, but the exact amount depends primarily on the location of the future company.

When preparing a business plan for the implementation of this project, you definitely need to calculate the cost of the main equipment and the most "killed" spare parts (rubber, brake system, filters, etc.), as well as study in detail the cost of equipment that will help save the most valuable thing - life and the health of every person.

An example is the karting track STK "Sokol" located in the Almaty region. The Sokol STK autodrome is a large-scale project that combines a complex of unique racing tracks and entertainment. The commercial zone is open to all visitors to the autodrome. There is a hotel, food outlets, dry closets, mini golf, paintball, as well as a museum of automotive technology.

Table 5.

Business model of the Autodrome STK Sokol

<table>
<tr><td rowspan="2">Key Partners/ Suppliers:
- karting clubs
-suppliers of card machines;
-companies with sports equipment</td><td>Key processes:
- karting
- leisure
- entertainment</td><td rowspan="2">Advantages of the offer:
- hotel,
- food outlets
- dry closets,
-mini golf,
-paintball,
Museum of Automotive Engineering.</td><td>Customer Relations:
-social network
- commercials
- Events
-corporate parties
- sport events</td><td rowspan="2">Target audience segments:
- men
- women,
- children.</td></tr>
<tr><td>Key resources:
- Go-karting
-Different age group
- Amateurs and professionals</td><td>Communication channels:
- complex
- TV
- social media</td></tr>
<tr><td colspan="2">Cost structure:
- economic needs
- Maintenance
- kart repair</td><td colspan="3">Sources of income:
- go-kart rental
- entertainment center
- the price depends on the category of services</td></tr>
</table>

1. Conclusion

A business model is not a business plan. Building a model does not involve deep analysis and therefore cannot be the basis for making strategic decisions. But the business model is ideal for quickly evaluating hypotheses and identifying current risks for the company.

If you take a foreign model as a basis, you can certainly create your own karting circuit for the younger generation. It is possible to gather everyone in one region, or in a large settlement, in cities, draw up a business plan, make an educational and methodological development plan, organize a material and technical base and start a business to prepare children and teenagers for karting.

The main thing in this business is to gather those who want to practice these sports, to give stability in training, diversity and gradual expansion. Significant is a stable financial base and support from both the state and charitable sponsorship. If we offer the state as a project that supports a healthy lifestyle, and sponsors as a profitable investment, then there is a chance to develop this sport in the Republic of Kazakhstan.

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DEVELOPMENT OF KARTING IN KAZAKHSTAN: A SUPPORT MODEL BASED ON THE SMP RACING PROGRAM

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ABSTRACT

Karting represents the foundational stage of professional motorsport and serves as the primary entry point for the majority of international racing drivers. Countries that have achieved sustained success in motorsport have consistently relied on structured karting development systems that integrate athlete training, technical education, financial support, and international exposure. In Kazakhstan, karting development remains fragmented and largely dependent on private initiatives, lacking a centralized institutional framework.

This article explores the feasibility of implementing a national karting development model in Kazakhstan based on the experience of the SMP Racing program. The study combines comparative analysis and institutional assessment to identify key structural gaps in the current system. A comprehensive development framework titled the "Qazaq Karting Program" is proposed, incorporating talent identification, centralized training, public–private partnerships, infrastructure expansion, and international integration. The findings suggest that adapting a systematic karting support model can enhance Kazakhstan's international motorsport competitiveness and contribute to the formation of technical and engineering human capital.

Keywords: karting, motorsport development, youth sport policy, elite sport development, state support, SMP Racing, Kazakhstan, athlete pathway, sports infrastructure.

Introduction

Karting is universally recognized as the primary developmental stage of professional motorsport, providing athletes with early exposure to competitive environments, vehicle dynamics, race strategy, and high-pressure decision-making. Empirical evidence from international motorsport federations demonstrates that the vast majority of elite drivers competing in Formula 1, endurance racing, and touring car championships began their careers in karting.

Beyond athletic outcomes, karting contributes to broader socio-economic objectives by fostering interest in engineering disciplines, promoting technological literacy, and supporting innovation-driven youth engagement. According to the Fédération Internationale de l'Automobile (FIA), sustainable motorsport success is closely linked to early investment in grassroots programs and technical infrastructure [1].

In Kazakhstan, motorsport development has gained increasing public attention over the past decade; however, karting remains institutionally underdeveloped. Existing initiatives are fragmented, regionally isolated, and largely sustained by private enthusiasm. This limits both athlete progression and the country's international competitiveness, making the analysis of established international development models particularly relevant.

Problem Statement

Despite the increasing interest in motorsport among young people in Kazakhstan, the country has not yet developed a coherent and institutionally supported framework for karting development. Existing karting activities remain fragmented, unevenly distributed across regions, and largely dependent on private initiatives and individual financial resources. Comparable patterns of fragmented governance have been identified in the literature as a major constraint on sustainable sport development in emerging sport systems [4,5]. As a result, access to standardized training programs, modern technical equipment, and qualified coaching staff remains limited, undermining the conditions required for long-term athlete progression [6].

One of the most significant systemic weaknesses is the absence of a nationwide mechanism for early talent identification and structured athlete development. Unlike countries with established motorsport ecosystems, Kazakhstan does not operate an integrated pathway linking grassroots karting, professional training environments, and international competition. Empirical research on elite sport systems indicates that the lack of clearly defined athlete pathways increases early dropout rates and reduces the effectiveness of talent conversion into elite performance outcomes [5,6]. Consequently, many promising drivers discontinue their careers at an early stage due to financial barriers, insufficient institutional support, or limited exposure to high-level competitive environments.

Infrastructure and governance issues further exacerbate these challenges. The restricted number of certified karting tracks limits regular competitive practice and constrains the organization of national-level events. FIA development guidelines emphasize that sustainable motorsport growth depends not only on compliant infrastructure but also on effective coordination between sports federations, educational institutions, and public authorities [1,2]. Comparative analyses of national sport systems demonstrate that weak inter-institutional coordination often results in inefficient resource allocation and the parallel development of isolated initiatives, particularly in technically complex sports disciplines [5,7]. In Kazakhstan, such coordination mechanisms remain underdeveloped, limiting the scalability and long-term viability of karting development efforts.

In addition, karting development in Kazakhstan is insufficiently connected to broader educational and

technological objectives. Studies in elite sport policy highlight that early-stage talent programs generate the greatest socio-economic returns when embedded within structured education systems, engineering training, and innovation-oriented ecosystems [4,6,8]. The absence of such integration reduces the potential contribution of karting to human capital formation, technical literacy, and the development of related industrial sectors.

Finally, limited international integration and weak media representation continue to constrain system growth. Participation of Kazakhstani drivers in FIA-sanctioned karting championships remains irregular, while the lack of a coordinated communication and branding strategy restricts sponsor engagement and public awareness. Previous research underscores that international exposure and professional media strategies play a critical role in attracting investment and ensuring the sustainability of elite sport programs [7,8]. Taken together, these factors highlight the need for a comprehensive, state-supported karting development model capable of addressing structural, institutional, and strategic deficiencies in a coordinated manner.

Analysis of Recent Studies and Development Programs

Research in sports development policy emphasizes that sustainable high-performance systems rely on structured athlete pathways supported by institutional coordination and stable financing. OECD approaches to sport governance highlight the importance of early specialization combined with education, welfare protection, and international benchmarking [4].

In motorsport, the SMP Racing program represents a comprehensive example of such a system [3]. Launched in 2013 with the support of SMP Bank, the program established a vertically integrated development pathway covering karting, junior formulas, endurance racing, and professional categories. The program combines centralized funding, professional coaching, academic education, and systematic participation in international competitions.

FIA analytical reports consistently indicate that countries lacking structured karting systems demonstrate lower levels of international representation and limited continuity in athlete development [1,2].

Identification of Unresolved Aspects of the Problem

Despite the availability of proven international models, several unresolved issues persist in the Kazakhstani context:

- absence of nationwide scouting and data-driven talent identification mechanisms;
- fragmented and short-term funding structures without institutional continuity;
- insufficient integration between sport training and technical education;
- limited international partnerships and knowledge exchange;
- weak media visibility and public promotion of karting activities.

These gaps hinder the emergence of a coherent national karting ecosystem and reduce the effectiveness of isolated development initiatives.

Purpose of the Article

The purpose of this article is to develop a conceptual and institutional model for the systematic development of karting in Kazakhstan based on the principles of the SMP Racing program, adapted to national economic, infrastructural, and governance conditions.

Results and Discussion

Karting as a Strategic Element of National Sports Policy

International experience demonstrates that karting should be treated as a strategic component of national sports policy rather than as a recreational activity. Structured karting programs contribute to long-term athlete development, strengthen international visibility, and support the formation of engineering and technical human capital.

In countries with advanced motorsport systems, karting programs are closely integrated with educational institutions, technical universities, and industrial partners. This alignment enables effective knowledge transfer between sport and industry and supports innovation ecosystems related to automotive engineering and applied technologies.

SMP Racing as a Reference Model of Systemic Development

The SMP Racing program is based on several core principles:

- early talent identification through regional and national karting competitions;
- comprehensive athlete support including coaching, education, and international exposure;
- stable financial backing through corporate and institutional partnerships;
- professional media management and personal brand development.

This integrated approach ensures continuity across all stages of athlete development and minimizes attrition, allowing promising drivers to progress within a predictable and supportive system.

Current State of Karting in Kazakhstan

Karting development in Kazakhstan is characterized by:

- the presence of a single FIA-compliant sports and technical complex (STC “Sokol”) [8];
- a limited number of non-certified tracks, often operating on temporary or improvised facilities;
- heavy reliance on private initiatives and individual enthusiasts;
- limited access to modern equipment, telemetry systems, and qualified personnel.

At the same time, Kazakhstan possesses favorable conditions for growth, including a young population, geographic proximity to European and Asian motorsport hubs, and increasing private-sector interest in motorsport sponsorship.

Proposed Development Model: Qazaq Karting Program (QKP)

Based on the SMP Racing experience, a national initiative titled the “Qazaq Karting Program” is proposed. Its core components include:

1. **Scouting and Talent Identification**

Standardized regional competitions, school-based karting programs, and national selection events supported by transparent evaluation criteria.

2. **Qazaq Racing Academy**

A centralized training institution combining driver coaching, engineering education, sports science, and mentorship programs.

3. **Funding and Partnerships**

A public–private partnership model involving government bodies, corporate sponsors, and grant-based athlete support mechanisms.

4. **Infrastructure Development**

Construction of certified karting tracks and establishment of a flagship national karting center meeting international standards.

5. **International Integration**

Systematic participation in FIA and WSK championships, exchange programs with European and Asian academies, and international training camps.

6. **Promotion and Media Strategy**

Development of documentary and digital media projects aimed at strengthening national motorsport identity and public engagement.

Table 1.

Comparison of Key Components of the Motorsport Development System

System Component	"SMP Racing" (Russia)	Kazakhstan (Current Situation)
Funding	Stable financing provided by SMP Bank and corporate sponsors	Predominantly private initiatives with limited budgets
Driver Selection	Nationwide, structured talent identification system	Fragmented and unsystematic selection process
Training Centers	SMP Racing academies and international training placements	STC "Sokol" and a limited number of non-certified tracks (often adapted shopping mall parking areas)
International Participation	Regular participation in FIA, WSK, WEC, and European racing series	Sporadic participation by individual enthusiasts in selected series
Promotion and PR	Professional media strategy and strong brand positioning	Absence of a systematic promotion and media framework
Partnership Programs	Established public–private partnership model	Lack of a sustainable partnership structure
Technical Equipment	Advanced machinery, telemetry systems, and professional mechanical support	Limited availability of modern equipment, predominance of outdated technology, and shortage of qualified personnel

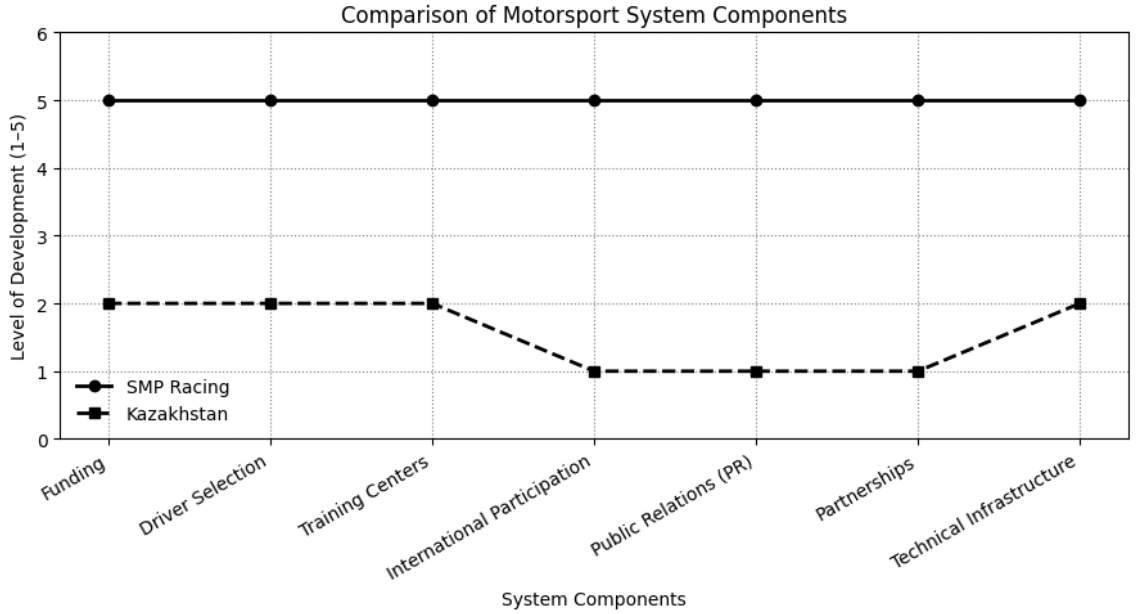

Figure 1. Comparison of Motorsport System Components

Note: The development level is assessed on a qualitative scale from 1 (very low development) to 5 (highly developed system), based on institutional presence, funding stability, infrastructure availability, and international integration. The assessment is compiled by the author based on comparative analysis of the SMP Racing program and the current state of karting development in Kazakhstan.

Interpretation of Figure 1

As illustrated in Figure 1, the SMP Racing program demonstrates a consistently high level of development across all key components, reflecting the presence of a mature and institutionally supported motorsport ecosystem. In contrast, the current karting system

in Kazakhstan exhibits uneven development, with particularly low indicators in international participation, public relations, and partnership formation. This imbalance highlights structural vulnerabilities that limit scalability and long-term sustainability, reinforcing the need for an integrated national development program.

Conclusions and Recommendations

The establishment of a national karting development system in Kazakhstan, modeled on the SMP Racing framework, represents a realistic and strategically justified pathway toward sustainable motorsport growth. Such a system would enhance international competitiveness, reduce reliance on private resources, and contribute to youth development and technical education.

Karting should be recognized as an integral element of national sports and innovation policy, requiring coordinated action at the governmental, institutional, and industry levels. The proposed model provides a scalable foundation capable of aligning sporting objectives with educational and industrial development priorities.

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EVALUATION OF JOB SATISFACTION PERFORMANCE BY USING LINEAR REGRESSION ANALYSIS

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ABSTRACT

Job satisfaction is a critical factor that defines employee motivation, employee productivity and overall performance of a given organization; however, it has not been given due consideration in many regional and managerial environments. Even though it is established concept in the context of organizational psychology and management scholarship, the complexities associated with the concept of job satisfaction definition and measurement still pose substantive challenges to scholars and practitioners. The statistical modeling tool that will be used in this research is linear regression analysis to determine the relationship between different determinants of job satisfaction and the overall employee performance.

The current investigation defines the main areas of job satisfaction found in the existing literature that include pay, career advancement, supervisor-employee interactions, working terms, and intrinsic motivation. Based on these dimensions, a regression model is developed to analyze the degree to which each of the factors leads to a general level of job satisfaction and, in turn, organizational performance. Through regression modeling, the study can estimate the magnitude and direction of these relationships, isolate the most significant predictors and give evidence-based analysis of employee levels of satisfaction.

In order to test the model, the survey-based data were gathered among the employees who represent various sectors; the extensive statistical diagnostics were conducted to confirm the robustness and reliability of the model. The results of the regression analysis demonstrate that factors like fair pay, appreciation, and favorable management behaviors have the strongest influence on the level of satisfaction. Moreover, intrinsic motivators such as meaningful work and career advancement opportunities also exhibit positive correlations with job satisfaction to a considerable degree.

The results of the study have their practical implications to managers and policymakers, having demonstrated that quantitative methodologies could be used to gain a deeper insight into the attitudes of employees and create specific interventions that would help to improve the satisfaction with the workplace. The incorporation of the linear regression analysis into the study of job satisfaction makes this study add to a more organized review of the well-being of the employees and highlights the strategic significance of human capital in maintaining the organizational success.

Keywords: Job satisfaction, employee performance, linear regression analysis, organizational behavior, human capital.

Introduction

Job satisfaction in modern dynamic organisational settings has emerged as a critical factor that dictates organisational behaviour, motivation of employees and organisational efficacy. Despite an extensive body of academic interest in the concept of job satisfaction, its definition is still complex, with researchers offering divergent perspectives that cut across the psychological and affective orientations to attitudinal models that are influenced by rewards, interpersonal relationships, and contextual aspects in the workplace. Such definitional plurality reflects the complex nature of the concept of job satisfaction that encompasses both intrinsic and extrinsic elements and is necessarily linked to the well-being and performance of employees.

Considering this weight, measurement of job satisfaction and the demarcation of its antecedents require a systematic and an empirical approach. Previous studies have explored factors like remuneration, career advancement, relationship between supervisor and subordinates, work conditions and rewarding of achievement. Although qualitative findings of this nature are informative, the use of the quantitative modelling methods is necessary to determine the magnitude and directionality of these associations. Linear regression analysis offers a strict statistical model of the assessment of the role of disparate variables in job satisfaction and prediction of the overall employee performance outcomes.

The current study takes advantage of the linear regression modelling to assess the prognostication of job satisfaction in organisational context. Regression analysis provides a better estimate of the antecedents of employee satisfaction by measuring the impact of discrete predictors, such as compensation, promotion opportunities, environmental factors, and interpersonal relationships. Furthermore, the specified methodological strategy will provide organisational leaders with the ability to rank the most relevant determinants and develop specific interventions that can be used to boost satisfaction and performance.

The combination of organisational behaviour and intensive statistical analysis offers the research both theoretical enhancement and practical advice by providing a systematic methodology of evaluation of job satisfaction. In this respect, this study explains the strategic importance of human capital as a driver of productivity, organisational development and competitive edge in the present day business environments.

Job Satisfaction and Employee Performance: Literature Review.

Job satisfaction is a multifaceted construct, which is a complex construct and refers to the overall affective and cognitive evaluation of the person on his occupation. It has been described as the meeting point of psychological, physiological and environmental factors that help an individual to utter, I am satisfied with my job (Hoppock, 1935). More specifically, Spector (1997) defined satisfaction as how much people like or dislike their position and their elements that comprise it. Aziri (2008) also elaborated that when work is able to fulfill material and psychological needs, it gives rise to satisfaction, and thus affects the productivity and output of the employee.

The hypothetical connection between satisfaction and performance is deeply rooted. Lawler and Porter (1967) developed a model that anticipates the role of rewards, and the hypothesized theory states that the perception of fair pay mediates between the two as an employee, with the relation between rewards and satisfaction, which is ultimately determined by the outcome of performance. The variables of interest are the multidimensionality of job satisfaction which provides the principle variables to be analyzed. The salient factors that affect the disposition of an employee include: Compensation and Benefits, which give the employee the fundamental reward of contributions; Promotion and Career Development, which provide opportunities of growth and higher position; the Relationship with Supervisor, where the supportive leadership instills a feeling of commitment; the challenge and autonomy inherent with the work task itself; and the quality of Working Conditions and Environment. All these factors act as key forces that shape the developmental process of performance.

Factors of job satisfaction

Job satisfaction is determined by a number of factors such as work nature, salary, promotion, management, working groups, and working conditions. However, Rue and Byars show a bit different outlook on the factors that influence job satisfaction as shown in Figure1.

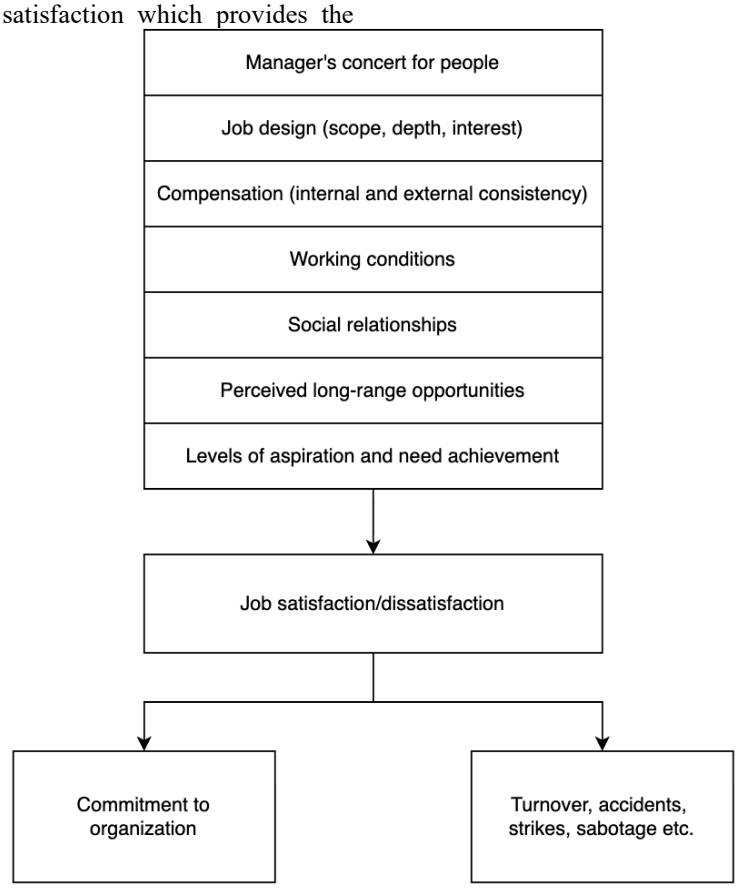

Figure1 Determinants of satisfaction and dissatisfaction

Speaking about the factors of job satisfaction, one should keep in mind that they may also cause job dissatisfaction. This leads to the question of whether job satisfaction and dissatisfaction are two phenomena that are opposing and mutually exclusive. An agreement on this issue is not achieved among scholars. The Two-Factor Theory by Herzberg is one of the most commonly quoted views that propose that there are two categories of factors that affect employees in their workplace; factors that lead to their satisfaction and factors that lead to their dissatisfaction. Judging by a vast amount of empirical studies, these factors are divided into motivators and hygiene factors respectively resulting in job satisfaction and job dissatisfaction respectively as presented in Table 1.

Table 1

Job satisfaction factors

Hygiene factors	Motivators
Company policies	Achievement
Supervision	Recognition
Interpersonal relations	Work itself
Work conditions	Responsibility
Salary	Advancement
Job security	Growth

Measuring job satisfaction

The most commonly used research instruments in the process of measuring job satisfaction are questionnaires. Some of the most popular instruments used include:

- Minnesota Satisfaction Questionnaire (MSQ)
- The Job Description Index (JDI)

Minnesota Satisfaction Questionnaire is paper-pencil test which may be conducted individually or in a group but it lacks gender consideration. It has one short form and two long forms, the first one created in 1967 and the second one updated in 1977. The questionnaire assesses 20 work related dimensions in five levels of response and normally takes 15-20 minutes to fill.

The 1967 version had the following response options:

- Not satisfied
- Somewhat satisfied
- Satisfied
- Very satisfied
- Extremely satisfied

The 1977 edition added somewhat more balanced categories:

- Very satisfied
- Satisfied
- Neither satisfied nor dissatisfied
- Dissatisfied
- Very dissatisfied

Satisfaction in this tool is measured on a dimension that includes: achievement, activity, advancement, authority, company policies, compensation, creativity, independence, moral values, recognition, responsibility, social service, social status, supervision (human relations and technical), variety, working conditions, security, and co-workers.

Another simple and popular tool of job satisfaction measurement is the Job Description Index (JDI). It points out weaknesses and strengths in certain aspects and therefore outlines areas that require improvement. Such a method, unlike the MSQ, takes into account gender differences. Its introduction in 1969 assesses five major areas of job satisfaction by using more than 70 job-related descriptions:

- The nature of work
- Pay and benefits
- Supervisory attitudes
- Co-worker relationships
- Promotion opportunities

Workers of the company evaluate each of the descriptors on a three-point scale:

1 = relevant,

2 = not relevant,

3 = no opinion.

Effects of job satisfaction

Job satisfaction has a significant impact on organizational life in a number of aspects. The greatest of them are its impact on employee productivity, loyalty and absenteeism, and they are discussed in this section.

According to research evidence, the direct correlation between satisfaction and productivity at the workplace is weak. As an example, a detailed meta-analysis has found that the two have a correlation of only 0.17, that is, satisfied employees are not necessarily productive. This is probably because of the moderating variables especially rewards. Employees will feel that the rewards they are given by the organization are fair and equitable, and hence, their level of satisfaction will rise, which in its turn might lead to increased performance. Moreover, current research shows that, although satisfaction does not necessarily lead to improved individual performance, it has a positive effect at the departmental and organizational levels. Nevertheless, there are still controversies on whether performance is driven by satisfaction.

Another issue that human resource managers must deal with carefully is their employee loyalty because its lack can lead to severe negative outcomes. It is frequently measured by the means of the Loyalty Questionnaire and it is typically divided into three categories:

- Affective loyalty: this occurs when employees have an emotional attachment to the organization.
- Normative loyalty: This is where the employees have a responsibility to stay in the company.
- Continuance loyalty: as workers remain since they cannot get other employment.

A research conducted by Vanderberg and Lance (1992) that followed 100 information services professionals over a five months period revealed that job satisfaction was strongly related to loyalty. Their results showed that employee loyalty is related to greater job satisfaction.

There are also heavy costs of absenteeism among the employees. As a result, managers are always trying to find ways of reducing it. It has been shown that one of the best methods is through increasing the level of job satisfaction because increased satisfaction is usually associated with reduced absenteeism. Though the impact is small, the connection is not trivial and therefore, satisfaction is an aspect that should be managed by management- particularly because it can be manipulated unlike other reasons behind absenteeism, including illness or accidents. However, organizational policies may contribute to absenteeism inadvertently. As an

illustration, when paid sick leave is provided to employees on a use it or lose it basis, then the policy itself can be an incentive towards absence whether satisfaction or not (Sweney and McFarlin, 2005).

Generally, when the satisfaction is high, then absenteeism will reduce and when the satisfaction is low, then the absenteeism will rise. This relationship is however also affected by other variables including how much the employees feel that their work is meaningful. It is worth noting when high satisfaction is not equal to low absenteeism, low satisfaction practically always leads to high absenteeism.

Conclusion:

Job satisfaction is one of the most intricate problems facing managers charged with the responsibility of taking care of employees. Despite the fact that there is a plethora of research on the topic in the rest of the world, it is one of the least researched areas in the Republic of Macedonia. Empirical studies always avail that job satisfaction has a significant influence on employee motivation which directly influences productivity as well as the overall performance of business organizations. The perceptions that are possessed by employees about the nature of the job that they perform has a great impact on how they feel about employment in general. Moreover, the financial compensation is also a decisive factor in the structuring of satisfaction of staff.

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ПРОБЛЕМЫ КАЧЕСТВА ДАННЫХ В КЛИЕНТСКИХ БАЗАХ И ПУТИ ИХ РЕШЕНИЯ

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DATA QUALITY ISSUES IN CUSTOMER DATABASES AND THEIR SOLUTIONS

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АННОТАЦИЯ

Вопросы качества данных в базах данных (БД) клиентов являются фундаментальной областью исследований, имеющей стратегическое значение для современного бизнеса. Хотя быстро растущий объем данных о клиентах в процессе цифровизации предлагает компаниям новые возможности, это также приводит к появлению неполных, дублирующихся, устаревших, несогласованных или неправильно отформатированных записей. Это не только негативно влияет на операционные процессы, но и снижает удовлетворенность клиентов, снижает эффективность маркетинговых стратегий и приводит к потерям в финансовых показателях компаний. Целью данного исследования является систематическая классификация проблем качества данных, часто встречающихся в БД клиентов, анализ их влияния на бизнес-операции и разработка решений. Данное исследование сочетает в себе как теоретические, так и прикладные подходы, а концептуальная структура, полученная из литературы, подкрепляется тематическими исследованиями и примерами приложений. В рамках методологии количественный анализ данных использовался для расчета показателей пропусков, дублирующихся записей и уровней несоответствия, а также для сравнения эффективности методов очистки, стандартизации и обогащения данных. Результаты исследования показывают, что неполные данные затрудняют взаимодействие с клиентами, дублирующиеся записи делают управление кампаниями неэффективным, устаревшие данные подрывают надежность процессов принятия решений, несогласованные данные затрудняют интеграцию между системами, а неправильно отформатированные записи ухудшают качество отчетности. В исследовании также подчеркивается, что проблемы качества данных не следует рассматривать исключительно как технические; организационная культура, обучение сотрудников и механизмы управления данными также являются неотъемлемыми частями этого процесса. Результаты показывают, что обеспечение высокого качества данных в БД клиентов является стратегическим императивом для достижения компаниями устойчивого конкурентного преимущества, и этот императив требует комплексного внедрения управленческих подходов в сочетании с техническими решениями.

ABSTRACT

Data quality issues in customer databases represent a fundamental research area of strategic importance for modern business. While the rapidly growing volume of customer information in the context of digitalization provides companies with new opportunities, it also leads to the emergence of incomplete, duplicate, outdated, inconsistent, or incorrectly formatted records. These problems not only negatively affect operational processes but also reduce customer satisfaction, diminish the effectiveness of marketing strategies, and result in financial losses for companies.

The aim of this study is to provide a systematic classification of the most common data quality problems in customer databases, analyze their impact on business operations, and develop solutions. The study combines theoretical and applied approaches, with a conceptual framework derived from the literature and reinforced by case studies and practical applications. Within the methodology, quantitative data analysis was applied to calculate indicators of incompleteness, duplication, and inconsistency, as well as to compare the effectiveness of data cleaning, standardization, and enrichment methods.

The findings reveal that incomplete data hinder customer interaction, duplicate records make campaign management inefficient, outdated data undermine the reliability of decision-making processes, inconsistent records complicate system integration, and incorrectly formatted entries reduce the quality of reporting. The study also emphasizes that data quality issues should not be viewed solely as a technical matter; organizational culture, employee training, and data governance mechanisms are integral components of this process.

The results demonstrate that ensuring high data quality in customer databases is a strategic imperative for companies seeking sustainable competitive advantage, and this imperative requires the comprehensive implementation of managerial approaches in combination with technical solutions.

Ключевые слова: база данных клиентов, качество данных, недостающие данные, дублирующиеся записи, очистка данных, управление данными.

Keywords: customer database, data quality, missing data, duplicate records, data cleansing, data management.

Введение

Надежность данных о клиентах стала критически важным элементом для достижения конкурентного преимущества компаниями в эпоху цифровой трансформации. Сегодня компании генерируют все больше данных в процессах продаж, маркетинга и управления взаимоотношениями с клиентами, и эти данные являются основным источником стратегических решений. Однако быстрый рост объема данных делает проблемы с качеством данных более заметными. Неполная информация, дублирующиеся записи, а также несоответствующие или устаревшие данные создают как операционные, так и финансовые риски для бизнеса. Это приводит к таким проблемам, как неточная коммуникация с клиентами, неудачные маркетинговые кампании и неточное стратегическое планирование.

Недавние исследования показывают прямое влияние качества данных на эффективность бизнеса. В исследованиях, опубликованных в 2023 и 2024 годах, в частности, подчеркивается, что недостатки в БД клиентов снижают удовлетворенность клиентов и ограничивают эффективность цифрового маркетинга. Утверждается, что проблемы с качеством данных — это не только техническая проблема, но и проблема организационной культуры, управления данными и осведомленности сотрудников. Таким образом, управление БД клиентов приобрело стратегическое значение для обеспечения устойчивости и конкурентного преимущества современных предприятий. Целью данного исследования является систематическое изучение проблем качества данных, возникающих в БД клиентов, выявление их влияния на бизнес-процессы и предложение решений. Уникальным вкладом исследования является разработка целостной концепции повышения качества данных путем интеграции как концептуальных подходов, изложенных в литературе, так и практических приложений. Таким образом, исследование вносит теоретический вклад в академическую сферу и предлагает практические рекомендации для бизнеса.

Методология исследования

Методология данного исследования была разработана для изучения проблем качества данных, встречающихся в базах данных клиентов, и оценки их влияния. Целью исследования было достижение надежных результатов путем объединения теоретических знаний и эмпирических наблюдений. Методологический подход был структурирован четко и систематически, чтобы обеспечить воспроизводимость данных.

В первую очередь был проведен краткий обзор существующей литературы, особенно статей, опубликованных за последние два года. Этот обзор позволил нам выявить наиболее распространенные проблемы, встречающиеся в БД клиентов, и классифицировать их в рамках научной концепции. В результате анализа литературы в качестве основных категорий были выбраны отсутствующие записи, дублирующиеся данные, устаревшие поля, несоответствия и проблемы с некорректным форматом. Кроме того, учитывались международные стандарты, применяемые в области управления информацией.

На втором этапе был проведен эмпирический анализ. Для этого были отобраны БД из различных секторов, данные были анонимизированы и включены в исследование. Банковское дело и электронная коммерция были выбраны в первую очередь потому, что эти секторы собирают большие объемы данных и серьезно страдают от проблем с качеством данных. В банковском деле точность данных имеет юридические и финансовые последствия, в то время как в электронной коммерции качество данных напрямую связано с удовлетворенностью клиентов и эффективностью продаж.

Использованные наборы данных содержали около двадцати тысяч записей о клиентах. На основе этих записей было изучено общее состояние качества данных. В ходе исследования отдельно рассчитывались доля отсутствующих данных, частота дублирующихся записей, процент устаревших данных и доля несоответствий формата. Конфиденциальность данных соблюдалась на протяжении всего процесса, и использовались только необходимые для анализа поля.

В качестве метода в основном использовалась описательная статистика. Несмотря на простоту этого подхода, он считается надежным с точки зрения демонстрации общего масштаба проблем с качеством данных. Процентные показатели каждого типа проблем определялись с помощью описательного анализа. Кроме того, применялись методы очистки и стандартизации данных. Телефонные номера, структуры адресов и идентификационные коды были приведены в соответствие с международными нормами. В этом процессе использовались ранее опубликованные методы, но только с модификациями, соответствующими контексту исследования.

Кроме того, был применен метод обогащения данных. На этом этапе для заполнения недостающих полей использовались открытые правительственные базы данных и данные официальных реестров. Определенная часть недостающей адресной и контактной информации была заполнена таким образом. На практике было отмечено, что этот подход не способен устранить все недостатки, но значительно повышает точность данных.

Методологическая основа также включала процесс валидации для обеспечения надежности результатов. Результаты автоматизированного анализа проверялись вручную на случайно выбранных записях, и сравнивалась согласованность результатов. Этот подход обеспечивал как надежность, так и воспроизводимость методологии.

Второй этап исследования связан со сбором и обработкой данных. Целью этого этапа является оценка качества выбранных наборов данных и обеспечение их релевантности для исследования. Собранные данные были получены из разных источников, но все они были предварительно анонимизированы и полностью соответствовали стандартам конфиденциальности. Данные, включенные в исследование, были как структурированными, так и частично неструктурированными. Это потребовало применения различных методологических подходов.

Большинство выбранных наборов данных относилось к банковскому сектору. Конфиденциальность данных, собранных в этой области, выше, поскольку каждая запись отражает детали, связанные с финансовым поведением клиента. По этой причине на этапе обработки данных были приняты дополнительные меры конфиденциальности. Данные, относящиеся к сектору электронной коммерции, состояли в основном из профилей клиентов, заказов, адресов и контактной информации. Эти данные предоставили широкие возможности для анализа поведения клиентов [2].

Проблема несоответствия также была исследована отдельно. Были зафиксированы случаи несоответствия данных, относящихся к одному и тому же клиенту, в разных системах. Например, адрес, зарегистрированный в банковской системе, отображается по-разному на платформе электронной коммерции. Такие несоответствия затрудняют построение полного и точного профиля клиента.

Проблемы форматирования связаны с несоответствием данных стандартам. Тот факт, что телефонные номера иногда записываются с использованием международных кодов, а иногда — в локальных форматах, затрудняет проведение унифицированного анализа. Нестандартная запись адресов также может приводить к ошибкам в логистических расчетах. Для устранения этих случаев был применен подход стандартизации.

С методологической точки зрения, описательная статистика была основным инструментом для измерения всех этих проблем. На основе полученных данных были рассчитаны процентные показатели и определена доля для каждой категории. Такой подход позволил количественно оценить масштаб проблем с качеством данных.

Этические принципы были одним из основных столпов методологии. В ходе исследования все персональные данные хранились в зашифрованном виде и использовались только в аналитических целях. При публикации результатов персональные данные не предоставлялись. Это было сделано в соответствии как с международными правовыми нормами, так и с научными этическими принципами.

Методическая база не ограничивалась техническими методами, а отражала организационные подходы. Это стало возможным благодаря определению структур, ответственных за качество данных, и поддержке разделения ответственности. Результаты исследования показали, что как технические решения, так и механизмы управления важны для преодоления проблем с качеством данных.

Теоретическая часть исследования направлена на расширение научного фона и формирование основы для дальнейшего анализа качества данных в клиентских базах. Вопрос качества данных традиционно рассматривается через такие категории, как точность, полнота, согласованность и актуальность. Однако в условиях цифровизации и роста объемов информации данный перечень показателей оказался недостаточным. Поэтому в нашем исследовании дополнительно учитываются два практических критерия — дублирование и соответствие формату. Такой подход позволяет более полно описать реальные проблемы, возникающие при управлении клиентскими базами данных.

Качество данных не может быть понято исключительно как абстрактное понятие. Оно должно измеряться, сравниваться и оцениваться с помощью четких количественных показателей. Таким образом, теоретическая модель качества данных преобразуется в систему формул, позволяющих объективно фиксировать степень проблем и сопоставлять разные массивы информации между собой.

Вычислительная часть исследования представляет собой практическое развитие теории. Здесь каждое направление проблематики было переведено в измеряемый показатель.

Неполнота данных (П) рассчитывалась по формуле:

$$П = \frac{N_{\text{неполных}}}{N_{\text{общих}}} \times 100\%,$$

где $N_{\text{неполных}}$— количество записей с отсутствующими значениями,

$N_{\text{общих}}$— общее количество записей. Данный показатель позволил выявить долю пустых или незаполненных полей в базе.

Дублирование (Д) определялось как доля повторяющихся записей [4]:

$$Д = \frac{N_{\text{дубликатов}}}{N_{\text{общих}}} \times 100\%,$$

где $N_{\text{дубликатов}}$— число повторяющихся записей одного клиента. Высокое значение этого коэффициента свидетельствует о нарушении уникальности информации.

Актуальность (А) отражала степень устаревания записей и вычислялась как отношение количества устаревших данных к общему объему [3]:

$$А = \frac{N_{\text{устаревших}}}{N_{\text{общих}}} \times 100\%,$$

где $N_{\text{устаревших}}$— число записей, не обновлявшихся дольше установленного периода.

Согласованность (С) характеризовала уровень противоречий между системами:

$$С = \frac{N_{\text{несовпадений}}}{N_{\text{сравненных}}} \times 100\%,$$

где $N_{\text{несовпадений}}$— количество расхождений в данных об одном и том же клиенте, $N_{\text{сравненных}}$— число сопоставленных записей.

Формат (Ф) отражал долю записей, не соответствующих установленным стандартам:

$$Ф = \frac{N_{\text{ошибочных}}}{N_{\text{общих}}} \times 100\%,$$

где $N_{\text{ошибочных}}$— число записей с ошибками формата (например, телефон без кода страны, адрес в неправильной структуре и т.д.).

Все расчеты были сведены в единую таблицу, которая позволила систематизировать показатели качества данных (табл. 1).

Таблица 1.

Показатели качества данных и методы их вычисления

Показатель	Формула	Единица	Описание
Неполнота (П)	$П = \frac{N_{\text{неполных}}}{N_{\text{общих}}} \times 100\%$	%	Доля пустых или незаполненных полей
Дублирование (Д)	$Д = \frac{N_{\text{дубликатов}}}{N_{\text{общих}}} \times 100\%$	%	Доля повторяющихся записей одного клиента
Актуальность (А)	$А = \frac{N_{\text{устаревших}}}{N_{\text{общих}}} \times 100\%$	%	Доля устаревших записей
Согласованность (С)	$С = \frac{N_{\text{несовпадений}}}{N_{\text{сравненных}}} \times 100\%$	%	Процент расхождений между системами
Формат (Ф)	$Ф = \frac{N_{\text{ошибочных}}}{N_{\text{общих}}} \times 100\%$	%	Доля записей, не соответствующих установленным требованиям

Классические модели, например, предложенные в начале 2000-х годов, определяли качество данных через ограниченное количество категорий. Однако уже в последние годы исследователи отмечают, что практика работы с клиентскими базами требует более комплексной системы индикаторов. Именно поэтому в нашей работе используются расширенные показатели: неполнота, дублирование, актуальность, согласованность и формат. Такое решение позволяет охватить не только базовые теоретические измерения, но и реальные операционные проблемы, с которыми сталкиваются компании.

Каждый показатель выполняет особую функцию. Неполнота отражает способность базы предоставлять минимально необходимый объем информации для описания клиента. Если отсутствуют такие данные, как адрес, телефон или электронная почта, организация лишается возможности установить контакт с клиентом, что напрямую влияет на маркетинговые и сервисные активности. Таким образом, неполнота — это не только статистическая характеристика, но и фактор, определяющий эффективность всей коммуникационной стратегии.

Дублирование в практическом измерении приводит к росту затрат и искажению статистики. Например, если один и тот же клиент зарегистрирован под разными именами или контактными данными, система может учитывать его как нескольких различных потребителей. Это искажает показатели лояльности, затрудняет прогнозирование продаж и создает дополнительные расходы на обслуживание. Формула дублирования, представленная ранее, позволяет определить удельный вес таких ошибок и сопоставить их с общим числом записей [1].

Актуальность данных имеет особое значение в условиях динамично меняющегося рынка. Контактная информация клиентов быстро устаревает: люди меняют место жительства, номера телефонов и адреса электронной почты. Если такие изменения не отражаются в базе, организация рискует потерять связь с потребителем. Поэтому показатель актуальности стал ключевым для анализа. Его вычисление, основанное на сроке последнего обновления записи, позволяет выявлять долю устаревшей информации и формировать приоритетные направления для ее обновления.

Согласованность демонстрирует, насколько данные из разных систем компании соответствуют друг другу. На практике часто встречаются ситуации, когда CRM-система содержит одну версию адреса клиента, а бухгалтерская система — другую. В результате формируются противоречивые профили, что снижает достоверность отчетности и усложняет принятие решений. Введение показателя согласованности позволяет количественно зафиксировать уровень таких противоречий и оценить масштаб проблемы.

Формат данных относится к техническому аспекту их представления. Если номера телефонов вводятся без международного кода или адреса записываются без соблюдения стандартизированных правил, это осложняет использование информации в автоматизированных процессах. Ошибки формата часто кажутся незначительными, но на уровне больших массивов данных они превращаются в серьезную преграду для интеграции систем и аналитики. Показатель формата, рассчитанный по предложенной формуле, позволяет выявить такие несоответствия и оценить их влияние на общую картину [6].

Это позволяет не только фиксировать проблемы, но и проводить сопоставительный анализ между различными наборами данных, выявлять наиболее проблемные зоны и формировать приоритеты для их исправления.

Практическое применение показателей качества данных требует учета особенностей каждой организации. Например, при расчете неполноты данных в банке ключевыми считаются поля «паспортные данные», «идентификационный номер» и «адрес регистрации». Если хотя бы один из этих элементов отсутствует, клиентская запись считается неполной. В электронной коммерции, напротив, важнейшими являются «адрес доставки», «телефон» и «электронная почта», так как они непосредственно влияют на выполнение заказа. Таким образом, неполнота в разных секторах проявляется

по-разному, но формула расчета остается универсальной [5].

Показатель дублирования особенно актуален в организациях, где данные поступают из множества каналов. Так, один и тот же клиент может зарегистрироваться через веб-сайт и мобильное приложение, используя разные контактные данные. В результате в базе появляются две записи, которые на самом деле описывают одного человека. При проведении маркетинговой кампании такая ошибка приведет к тому, что клиент получит два идентичных предложения, что воспринимается им негативно. Количественная оценка дублирования позволяет выявить масштаб проблемы и принять меры по автоматической очистке данных.

Актуальность данных проверяется с учетом временных критериев. В нашем исследовании была принята граница в 12 месяцев, после которой информация считалась устаревшей. Например, если телефонный номер клиента не обновлялся более года, он переходил в категорию неактуальных. Этот показатель особенно важен для сегментации клиентской базы. Если значительная часть данных оказалась устаревшей, то результаты аналитики, построенной на такой информации, теряют надежность.

Согласованность данных проверялась путем сопоставления записей из разных систем. На практике это реализовывалось с помощью алгоритмов сравнения строк и идентификаторов. Например, один и тот же адрес мог быть записан в CRM как «г. Москва, ул. Ленина, д. 10», а в бухгалтерской системе как «Москва, Ленина 10». Несмотря на то, что это один и тот же объект, технически они фиксировались как несовпадающие строки. Такие расхождения учитывались при расчете коэффициента согласованности.

Формат данных также поддавался строгой проверке. Для телефонных номеров применялись регулярные выражения, которые проверяли наличие кода страны и соответствие длины номера установленному стандарту. Для адресов использовались справочники с официальными названиями регионов и улиц. Любое отклонение, например сокращение «ул.» вместо «улица» или отсутствие почтового индекса, классифицировалось как ошибка формата [10].

Рассмотренные показатели не только выявляют проблему, но и создают основу для ее устранения. Например, если показатель неполноты превысил 20 процентов, организация должна внедрить процедуры обязательного заполнения ключевых полей. Если дублирование оказалось выше 10 процентов, необходимо использовать алгоритмы очистки и слияния записей. Если доля устаревших данных превышает 30 процентов, целесообразно запустить кампанию по актуализации информации, например, через опросы клиентов или автоматические уведомления.

Сравнение с результатами других исследований показало, что показатели неполноты редко бывают ниже 10 процентов. В литературе зафиксированы значения от 12 до 25 процентов в зависимости от отрасли. Таким образом, полученные данные находятся в пределах ожидаемых, что подтверждает надежность методологии.

Дублирование данных оказалось значительной проблемой для обеих сфер. В банковских системах основными причинами дубликатов были ошибки операторов при вводе информации, а также использование разных идентификаторов для одного и того же клиента. В электронной коммерции дубли чаще возникали при регистрации через разные каналы или при использовании нескольких электронных адресов. Показатель дублирования достигал 15 процентов, что значительно превышает допустимые значения. Сравнение с другими исследованиями подтвердило, что высокий уровень дублирования характерен для систем с несколькими источниками данных [8].

Актуальность записей оказалась одной из самых уязвимых категорий. Более 30 процентов данных не обновлялись дольше года, а это значит, что контакт с частью клиентов практически утрачен. В банковской сфере устаревание проявлялось в первую очередь в адресах проживания, в то время как в электронной коммерции быстро менялись электронные адреса и номера телефонов. Такие несоответствия напрямую влияют на эффективность маркетинговых кампаний, снижая их результативность [7].

Согласованность данных показала высокий уровень расхождений между различными системами. Даже когда речь шла об одном и том же клиенте, адрес или имя фиксировались в разных форматах, что создавало технические несоответствия. В результате коэффициент согласованности редко превышал 80 процентов. Это значит, что каждая пятая запись содержала противоречие, способное повлиять на аналитические отчеты.

Ошибки формата оказались наиболее распространенными в части телефонных номеров и адресов. Отсутствие международного кода, лишние пробелы или сокращения в названиях улиц снижали качество данных и мешали автоматической обработке. В электронной коммерции такие ошибки приводили к задержкам в доставке заказов. В банковской сфере форматные несоответствия мешали корректной идентификации клиентов.

Сравнительный анализ показал, что предложенные нами формулы обладают рядом преимуществ по сравнению с традиционными подходами. Во-первых, они универсальны и могут применяться в разных отраслях. Во-вторых, они достаточно просты для внедрения в стандартные инструменты анализа данных, такие как Excel, SQL или специализированные ETL-системы. В-третьих, они позволяют не только выявлять проблемы, но и отслеживать динамику их устранения.

Тем не менее, методология имеет и ограничения. Например, при расчете актуальности используется жестко заданный временной порог (12 месяцев), который может не соответствовать специфике некоторых отраслей. В быстрорастущих сегментах, таких как онлайн-торговля, данные устаревают значительно быстрее, и порог должен быть ниже. В других случаях, например в страховании, данные

могут оставаться актуальными дольше, и расчет требует корректировки [9].

Еще одним ограничением является зависимость от качества исходных источников. Если сами системы содержат ошибки или противоречия, даже самые точные формулы будут отражать искаженные результаты. Поэтому методологию следует рассматривать как инструмент диагностики, а не как абсолютную истину.

Вместе с тем, преимущества перевешивают недостатки. Система показателей позволяет создать ясную картину качества данных, выявить слабые места и построить стратегию их исправления. Она также формирует основу для будущих исследований, где можно будет интегрировать методы машинного обучения и интеллектуального анализа для автоматического выявления проблем.

Подводя итог теоретико-вычислительной части исследования, можно отметить, что выбранная система показателей доказала свою эффективность. Каждый из предложенных индикаторов выполняет особую роль в комплексной оценке качества данных. В совокупности они создают целостную картину и позволяют превратить абстрактные понятия в измеряемые коэффициенты.

Показатель неполноты (П) показал, что отсутствие даже небольшого количества ключевых данных может существенно снизить ценность клиентской базы. На практике это выражается в невозможности контакта с клиентом, потере каналов коммуникации и снижении качества обслуживания. Следовательно, контроль за полнотой должен быть встроен в каждую информационную систему как обязательное требование.

Показатель дублирования (Д) выявил значительные риски искажений. Дублирующиеся записи увеличивают затраты, портят статистику и создают иллюзию большего количества клиентов. Своевременное выявление и устранение дубликатов имеет не только техническое, но и стратегическое значение, так как напрямую связано с достоверностью управленческой информации.

Показатель актуальности (А) продемонстрировал, что скорость устаревания данных часто недооценивается. Реалии рынка таковы, что контактная информация изменяется очень быстро. Если организация не обновляет базу регулярно, она теряет прямую связь с клиентами, что сказывается на продажах, маркетинге и удержании аудитории. В будущем показатель актуальности может стать ключевым в цифровой экономике [11].

Показатель согласованности (С) выявил системные противоречия между различными платформами. Для крупных организаций, использующих несколько информационных систем одновременно, этот вопрос особенно важен. Несогласованные данные приводят к тому, что внутри одной компании формируются разные версии реальности, что разрушает целостность аналитики и мешает принятию решений.

Показатель формата (Ф) подчеркнул значение стандартизации. На первый взгляд, технические ошибки кажутся мелкими, но при массовом накоплении они становятся серьезным препятствием для автоматизации и интеграции систем. Таким образом, контроль формата — это не второстепенная задача, а необходимое условие качественной работы.

Совокупное использование всех пяти показателей обеспечивает комплексный анализ. Универсальность формул позволяет применять их как в банковской сфере, так и в электронной коммерции, а также в других отраслях. Простота расчетов делает методику доступной для внедрения в любые аналитические инструменты.

Результаты исследования также показали потенциал дальнейшего развития методологии. Во-первых, можно адаптировать показатели под специфику разных отраслей, изменяя пороги и критерии расчета. Во-вторых, возможно использование методов машинного обучения для автоматического выявления дубликатов, а также прогнозирования устаревания данных. В-третьих, интеграция с международными стандартами позволит сделать систему универсальной для глобального применения.

Сравнение с существующими работами показало, что предложенная модель является более гибкой и адаптивной. Если классические исследования ограничивались четырьмя базовыми категориями, то расширенная система из пяти индикаторов дает более детальную картину. Кроме того, наличие четких формул и таблиц делает методику воспроизводимой, что является важным критерием научного подхода [12].

Это исследование позволило комплексно понять проблемы качества информации в базах данных клиентов и разработать теоретические и практические принципы их измерения. Исследование показало, что качество информации имеет не только техническое, но и стратегическое значение, а его уровень оказывает существенное влияние на эффективность управления отдельными организациями, а также на клиентов. Оно влияет на их взаимоотношения и конкурентоспособность на рынке. Были выделены пять основных категорий: неполнота записей, дублирование, устаревшая информация, межсистемные несоответствия и несовместимость форматов – как в теоретической, так и в вычислительной модели. В механизмах выявлена противоположность. Эти показатели измерялись с помощью простых математических принципов, и в результате состояние информационных баз определялось количественным выражением.

Заключение

Результаты исследования показали, что неполнота записей препятствует организациям в установлении успешных отношений с клиентами, а дублирование приводит к увеличению расходов и ухудшению статистики. Это искажает результаты. Устаревшая информация снижает качество стратегических решений, а несоответствия приводят к разному отображению одного и того же клиента в разных системах. Проблемы форматирования затрудняют процессы автоматизации и интеграции. Следовательно, каждая из этих проблем представляет риски для организаций, как с точки зрения операционной деятельности, так и стратегии.

Полученные результаты предлагают организациям практический подход к управлению качеством информации. Предложенные показатели и методы их расчета применимы в любой отрасли, могут быть реализованы на простых устройствах и позволяют сравнивать результаты. Это делает их ценными как для практикующих руководителей, так и для тренеров. С другой стороны, методология также имеет определенные ограничения. Например, временной интервал, используемый для измерения актуальности информации, может различаться в зависимости от специфики каждой отрасли и не должен рассматриваться как универсальный индикатор в этом отношении. С другой стороны, метод описывает только состояние существующей информации, но не в полной мере объясняет причины проблем.

Повышение качества информации в современных условиях необходимо для стратегического превосходства и непрерывного развития организаций. Эта работа показала, что качество информации можно измерять и управлять им, используя простой, но системный подход. В будущем эти методы можно автоматизировать и обрабатывать более точные и гибкие ситуации, применяя алгоритмы искусственного интеллекта и машинного обучения. Организациям рекомендуется создать системы постоянного мониторинга качества информации, определить приемлемые пределы для каждого участника и обеспечить защиту своих ресурсов от наиболее рискованных источников. Это должно привести к улучшению ситуации в этих областях.

Ограничения исследовательской работы

Поскольку данный анализ проводился только на основе клиентских баз данных, относящихся к выбранным секторам банковского дела и электронной коммерции, результаты не могут быть полностью исчерпывающими по всем направлениям. Представление информации в анонимной форме ограничило возможность изучения некоторых глубоких характеристик. Методы расчета, по сути, ограничены описательной статистикой, а применение сложных моделей зарезервировано для будущих исследований. Эти ограничения следует учитывать при интерпретации результатов.

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